American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

MAY 10, 1954

How to grind non-cylindrical shapes...
A SPECIAL REPORT

•

Automatic silver brazing

•

Machine-tool dynamometers...
A CURRENT APPRAISAL

Turnabout banjo tooling...
SEE PAGE 2

. . . Seen any lamplighters lately?

THE lamplighter's job seemed pretty secure . . . until someone discovered how to light a lamp without a flame; turn it out at the flick of a switch. Then the lamplighter disappeared — but a whole new industry was born.

For competition is at work everywhere, constantly directing the shape of things to come. Products that are better or less costly forge ahead — others are left behind.

Today, with competition rising to a normal, healthy pitch, manufacturers everywhere are seeking new ways to improve production and cut costs. That's where we at Heald can help you. In the vital matter of precision finishing, new Heald machines and advanced Heald engineering can often effect substantial savings—improve production speed and product quality too! Ask your Heald representative about the latest developments in automation, simultaneous and progressive borizing, improved grinding and loading methods.

Competition is wonderful if you're *ahead* of it. Our business is to help keep you there. That's why IT PAYS TO COME TO HEALD.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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chips

BANJO ... Our cover picture shows the machining of one of three sizes of lift-truck drive-axle housings. All are done with the same tooling, as are the opposite ends, by turning them end for end. A standard Gisholt Simplimatic lathe, with standard tooling, does the job, as well as the tie-bar pads which hold the housings to truck frames. Details of the tooling are shown in two pages in this issue.

NON-CYLINDRICAL SHAPES ... Some months ago, Associate Editor Wright set to work to uncover all the methods and principles for grinding non-cylindrical contours. He comes up with a whopping 20-page Special Report, showing use of lobed driveshafts to replace splined ones, how to grind camshafts, pistons, eccentrics, polygonal forms, turbine buckets, loose and integral cams, and other shapes.

SILVER BRAZING ... Semi-automatic assembly of fan blades and hubs is shown in our lead article. Two Sawyer-Bailey engineers show fixturing, hopper feed of brazing metal as a powder, interval heating of the hub to prevent blade carbonization, and other key points.

DYNAMOMETERS ... A year ago, three MIT experts agreed to write for us a current appraisal of machine-tool dynamometers. Here it is, by N H Cook, E G Loewen, and M C Shaw, a practical evaluation of current types and a review of basic principles, in five fact-filled pages.

SIMPLER ASSEMBLY ... George DeGroat, our Detroit technical ear-to-the-ground, has made a high-spot survey at Burroughs of new ideas in subassembly and assembly on a bookkeeping machine. He brings them to you in this issue in six pages of pictures and sketches, with captions.

TWO A MINUTE ... George has also been to the new Westinghouse refrigerator plant at Columbus, brings closeup pictures that show coordinated conveyors, chip disposal, special tooling on strip, automatic welding, press automation—a lot of specific ideas you can use.

SPIN IN SALT ... Charles G Lee, chief metallurgist of Micromatic Hone Corp (see biog) tells how he uses a salt bath for selective hardening of bull-gear teeth. Four gears are timed, put on a shaft and lowered so just the teeth are in the salt. Rotating the gears does the job in 4½ min, without distortion, and core hardness is correct.

CENTERLESS SHAPING ... Orange (NJ) Products Co makes a variety of complex shapes in plastics and wood. We have a description of how it's done, with crush-dressed 7- to 15-in.-wide wheels, and how the wheels are dressed.

REPORT ... A report of the Tool Show and ASTE Convention, and an enlarged section describing new equipment are departmental features of this issue . . . We are also happy to report that the 1954 Planbook, published last November, has received a special award for excellence in printing typography from NY Employing Printers' Assn.

COMING ... May 24 *AM* will, like our April 12 issue, include two Special Reports, one on Canada, one on bending aluminum tube and bar. There'll be our usual variety of articles, too. Watch for it, for the useful and surprising ideas you've a right to expect.

SPINNER . . . Charles G Lee, metallurgist at Micromatic Hone Corp, Detroit, tells in this issue about hardening gear teeth by spinning them in a salt bath. He has been with Micromatic since 1950. From 1939 to 1943, he was employed as a Metallurgical Lab assistant at Rotary Electric Steel Co, Detroit, and attended Wayne University in Detroit. He served in the Armed Forces in the CBI Theater and after the war was employed by the US Government at one of the large Arsenals as an induction-heat-treatment specialist.

ONE CUT
FROM THE SOLID
16 D. P. and Finer

- Gleason No. 2 Straight Bevel Generator
- Complete Precision Gears in one Operation
- Features Interlocking Multi-blade CONIFLEX® Cutters
- Easily Set-up for Job Lot Quantities
- Can Be Equipped with Automatic Loader
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GLEASON

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BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

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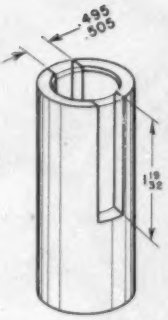
DIAGRAM OF PROFITABLE INVESTMENT

IN NEW MILLING MACHINE EQUIPMENT

Complex designs beget complex parts. This modern-day phenomenon of complexity has been happening to products of all types, from toys to jet engines. Machining operations are likewise becoming more complex, requiring many of the latest CINCINNATI developments in machining, such as 360° automatic tracing; high-speed carbide broaching; "twist" milling; automatically synchronized horizontal and vertical milling. ¶ The equipment illustrated here, a CINCINNATI No. 2-24 Plain Automatic Rise and Fall Milling Machine, performs operations of the latter type; the automatic cycle circumscribes a box-shaped figure. The milling operation itself, mill ½" slot 1⅝" deep in couplings (see part drawing), is rather simple, but to keep the cost at the very lowest, Cincinnati Application Engineers chose the rise and fall style machine, and equipped it with two three-station hydraulic clamping fixtures. The slots in both sets of parts are machined by the "down-milling" method, a cost-cutting advantage gained from the machine's Automatic Backlash Eliminator. To jump over obstructions in the fixture, the spindle carrier rapid traverses up and down, synchronized with the table traverses from one position to the next. An automatic stop position at the center of the cycle provides complete safety for the operator. ¶ Whether your milling operations are simple or complex, you can do them better and at lower cost on a CINCINNATI. For brief data on the No. 2-24 line, look in Sweet's Machine Tool Catalog. Complete information may be obtained by writing for catalog No. M-1760.

Drawing of part →



PRODUCTION DATA:

Part name	Coupling
Material	Steel
Stock removal	From solid
Cutting speed	76 feet per minute
Feed	3½ inches per minute (one cut)
Production	112 Couplings per hour

CINCINNATI No. 2-24 Plain Automatic Rise-and-Fall Milling Machine. Catalog No. M-1760.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

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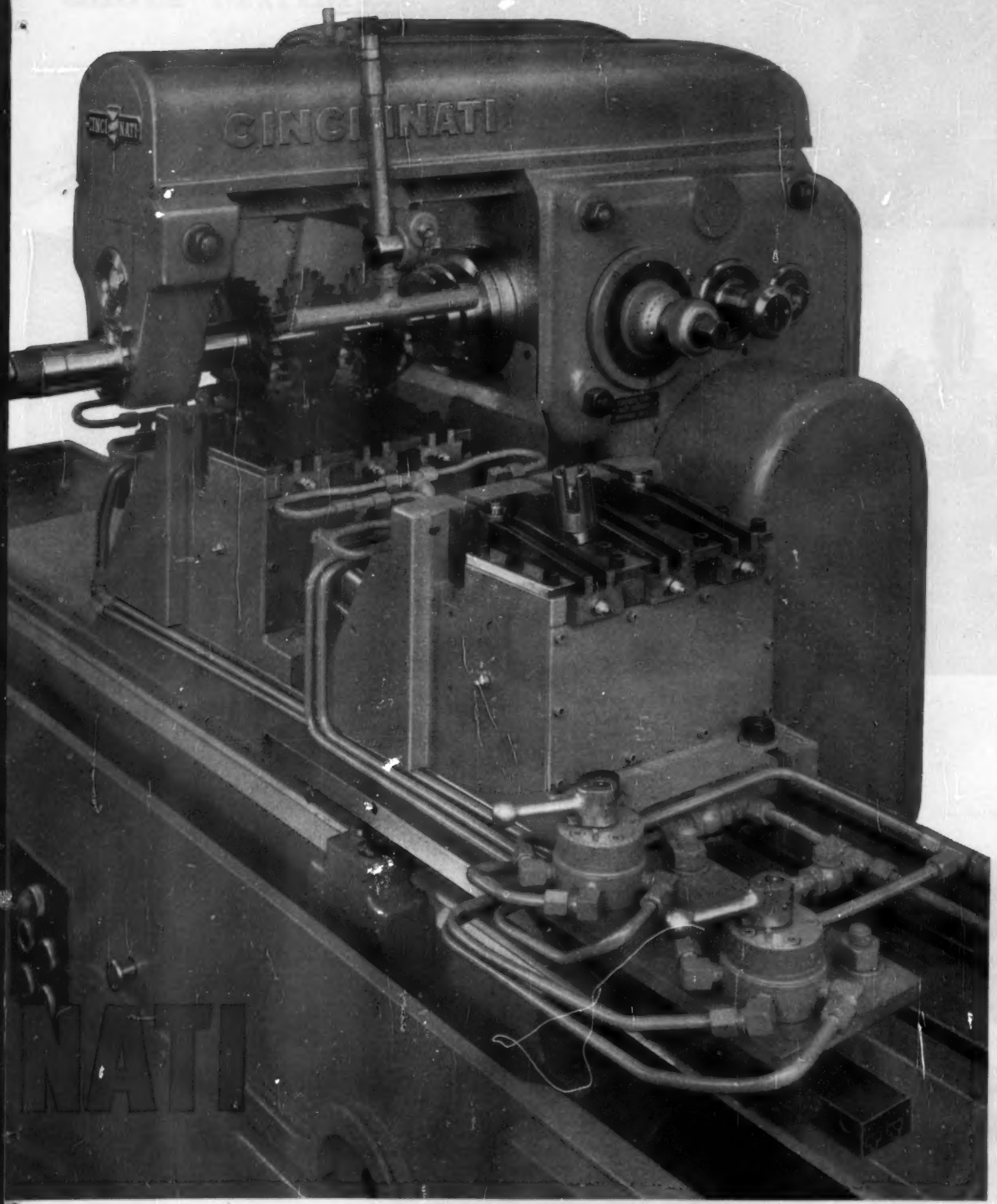
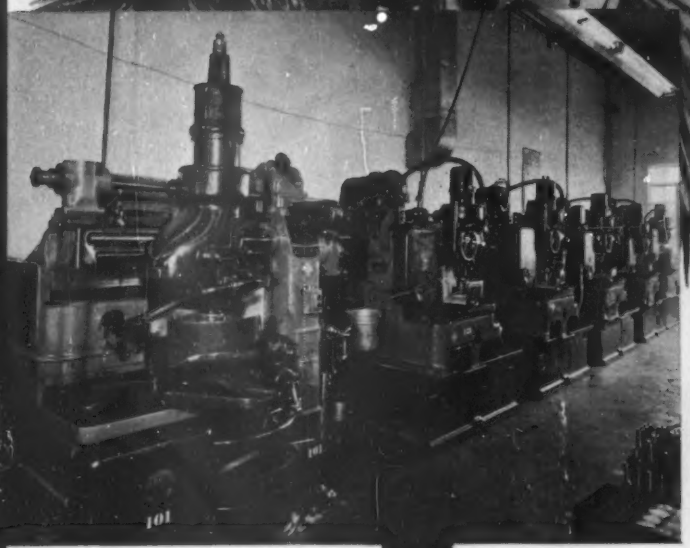
MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

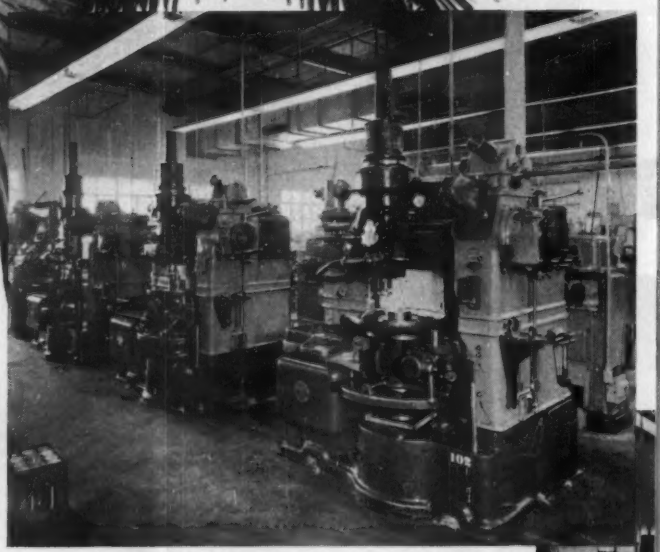
CINCINNATI No. 2-24

Plain Automatic Rise and Fall Milling Machine tooled up to mill a deep slot in couplings. A sample coupling is shown on the right-hand fixture.



PRECISION





Above: *Three of the 6-A Type Gear Shapers in line with a No. 12 Fellows Shaving Machine at the Frohman #1 Plant in Miami.*

Above left: *An additional 6-A and a battery of 7-A and 7-Type machines at the same plant.*

At right: *The line-up of 3-Inch Gear Shapers and No. 4 Fellows Shaving Machines face each other in efficient-handling proximity.*

Fellows

Pays Off
under MIAMI's Sun, too!

A reputation for Extra High Quality Gears can make itself known against a Florida background as readily as anywhere 'up north'...Harry Frohman found it so when he located his Frohman Manufacturing Co. in Miami—equipped the shop with Fellows machines, tooled up with Fellows Cutters and began making the plant a prime source of good gears. Aviation and instrument gear contracts, in particular, have flowed in Frohman's direction *for very good reason.*

Samples of gears in current production with the specified tolerances, etc., are illustrated here, along with the line-ups of Gear Shapers on which they are cut. The invisible ingredient is the very low percentage of rejects which so largely contributes to cost economy.

Whether in Miami, Milwaukee, or Monterey, the Fellows Method is a sound approach to keeping costs *down* and quality *up*. For specific machine or method information, wire, write or telephone the nearest Fellows office.

TYPICAL GEAR JOBS

The gear items pictured and detailed here are selected from hundreds in production and scheduled for early delivery from the Frohman Plant.

Description	Ext. Gear and Spline	Ext. Gear and 2 Int. Splines	Ext. Spline and Int. Spline	External Gear
Pitch Diameter	7.375"	3.036"	4.2182"	4.833"
Diameter Pitch	16 and 20/30	9.881, 20/40 and 11	32/64 for both	24
No. Teeth	118 and 30	30, 29, and 28	137 and 112	116
Press. Angle	25° and 30°	22½°, 30° and 20°	30°	14½°
Material	Nitralloy 135 Mod.	SAE 9310	SAE 8740	Alum. Bronze
Limits	.0005"	.0005"	.0005"	.0005" TIR
Notes	Spline cut after hardening to Rc 32/36	20/40 spline cut after hardening	All cutting after hardening to Rc 32/38	Cut @ 4 pc. loading

GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39.
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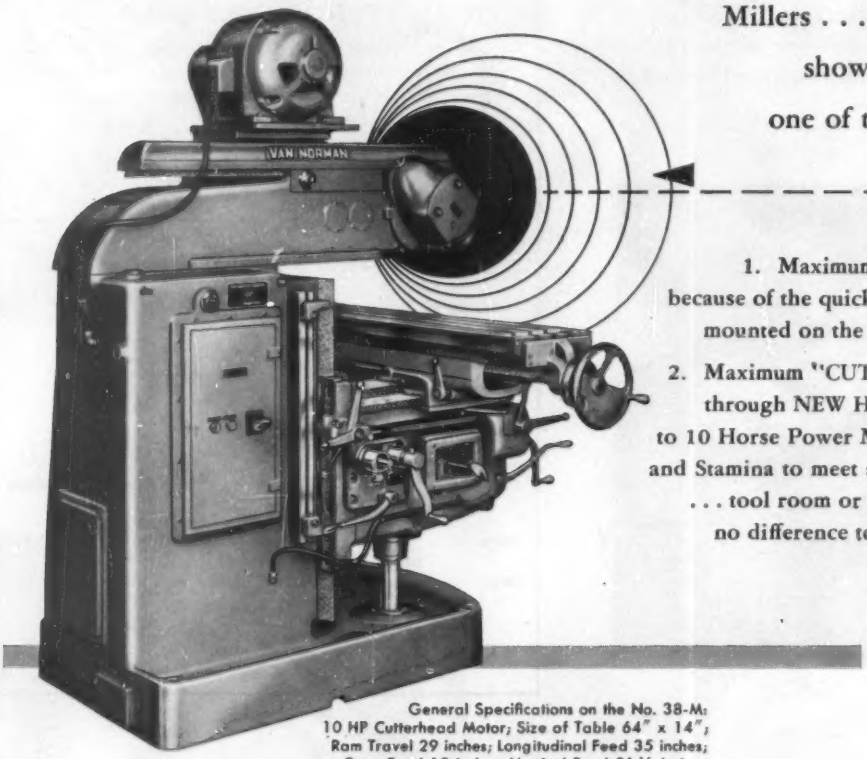
all 10 of Van Norman's new Ram-Type Millers have this exclusive feature

VAN NORMAN 38-M RAM-TYPE MILLER



General Specifications on the No. 38-M:
10 HP Cutterhead Motor; Size of Table 64" x 14";
Ram Travel 29 inches; Longitudinal Feed 35 inches;
Cross Feed 12 inches; Vertical Feed 21 ¼ inches.

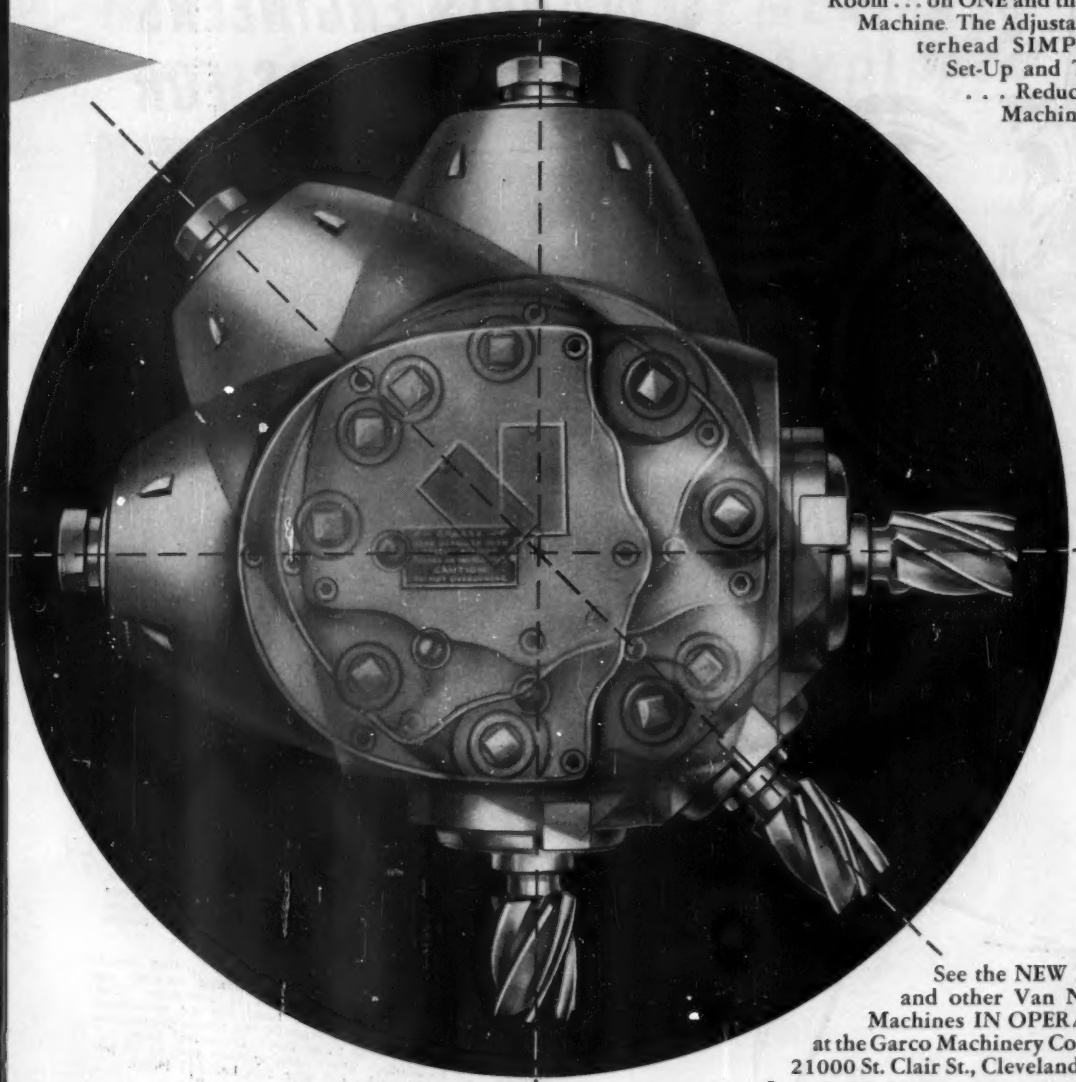
Check the exclusive features of Van Norman's new Ram-Type Millers . . . like the No. 38-M shown at the left. Every one of these machines has:

1. Maximum "FLEX-ABILITY" . . . because of the quickly adjustable cutterhead mounted on the Heavy Duty sliding ram.
2. Maximum "CUT-ABILITY" is provided through NEW Heavy Duty gears with up to 10 Horse Power Motors. Plenty of Power and Stamina to meet any milling requirement . . . tool room or production . . . it makes no difference to the NEW Van Norman Ram-Type Millers.

VAN NORMAN manufactures Ram and Column Type Milling Machines . . . Cylindrical Grinders . . . Centerless Grinders . . . Spline and Gear Grinders . . . Oscillating Radius Grinders . . . Special Production Grinders.

WITH THE ADJUSTABLE CUTTERHEAD

You do Horizontal, Vertical, OR Angular Milling . . . Production or Tool Room . . . on ONE and the SAME Machine. The Adjustable Cutterhead SIMPLIFIES Set-Up and Tooling . . . Reduces Idle Machine Time.



See the NEW Millers and other Van Norman Machines IN OPERATION at the Garco Machinery Co. Show, 21000 St. Clair St., Cleveland, Ohio, June 9, 10, 11.

See Your Dealer or Phone, Wire or Write

VAN NORMAN COMPANY
SPRINGFIELD • MASSACHUSETTS

Need Help on

LANDIS ENGINEERS METHODS FOR

1. (Above): A 1½" LANDMACC double spindle machine engineered for threading of V-Belt sheaves is equipped with a 1½" LANCO Head for external threading and a 3ALT tap for internal threading. The complete threading requirements for the work piece are accomplished by one machine and one operator, therefore reducing labor and handling costs.

2. (Right): A special Collapsible Tap used to thread 12" to 18" valve bodies for seat ring insertions. Landis Valve Seat Taps are individually engineered for their particular usage and are supplied to tap valve bodies ranging from the 2" to the 24" size.

4. (Right): A LANCO Taper Cutting Head designed for producing tapered threads up to 2¼" in length and to unusually close tolerances. The die head can be converted to cut a reverse taper by the simple application of a reverse taper cam. Diameters from ½" to 2" and tapers ranging from zero to 2" per foot can be cut with this LANDIS Head.

LANDIS *Machine*

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS

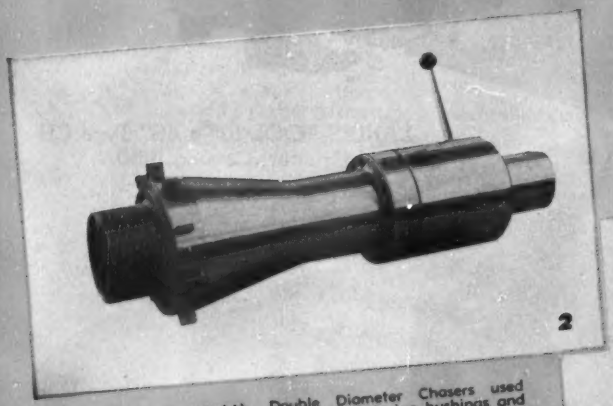
Difficult Threading Jobs?

DEVISE SPECIAL EQUIPMENT AND "HARD-TO-THREAD" WORKPIECES

Don't let the production of an unusual thread hinder an otherwise efficient manufacturing process. Hundreds of companies are today, with *LANDIS* equipment, profitably generating threads formerly considered impossible or too costly for practical operation.

We offer to all manufacturers aid in solving problems in all phases of thread production. We will consult on the original design to insure that the proper thread to best serve a particular function is employed; we will advise as to the best standard equipment to produce a specific thread; we will develop special tooling for the production of an unusual or difficult thread; we will design special holding fixtures for threading workpieces that are difficult to chuck; or we will work out special methods to best fit multiple threading operations into the complete production process.

The illustrations show four examples of such Threading Problems solved by our Engineering Department. No matter what your Threading Problem—let our years of Thread Experience and Engineering Know-How work with you in its solution. Write or call *LANDIS* today.



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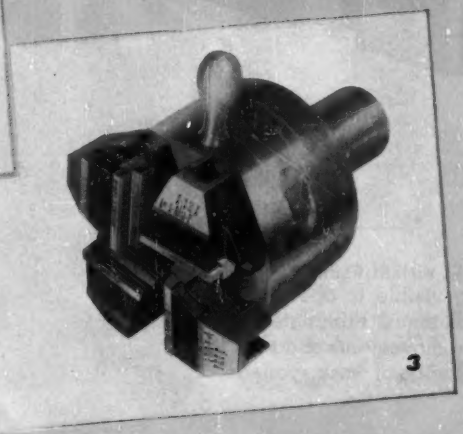


3

3. (Right). Double Diameter Chasers used to generate threads on reducing bushings and similar work pieces. These chasers cut threads on two different diameters simultaneously; thus, eliminating a second operation. Pitch and thread form for the two diameters must be identical and other limitations necessitate individually designed chasers for threading parts of different dimensions.

4

CO. OF

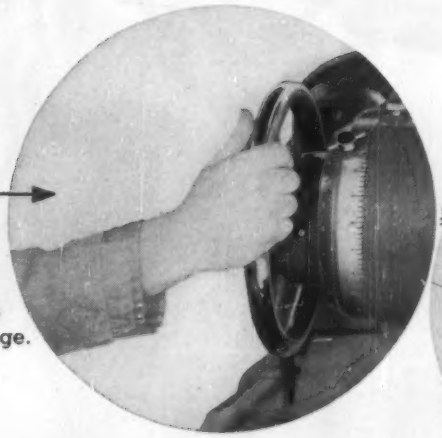
LANDIS U.S. TRADE MARK PAT. OFF.

WAYNESBORO PENNSYLVANIA

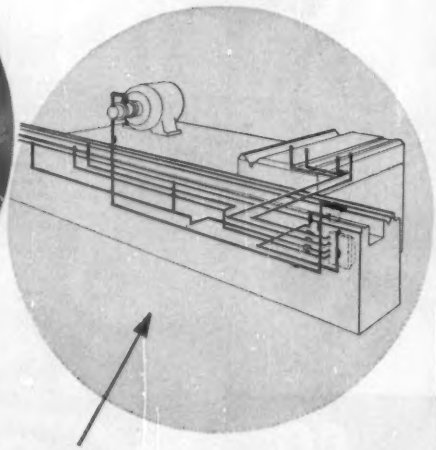
THREAD GENERATING EQUIPMENT

6 REASONS FOR INCREASED GRINDING

LANDIS TOOL 10" x 48" Type CH Plain Grinder. Catalog B-50.



EYE LEVEL WHEEL FEED and grinding visible to operator at all times. Eliminates awkward movements and reduces chance of work spoilage.



CONTROLLED WAY LUBRICATION assures proper lubrication at all times. Pressure safety switch eliminates chance of damaging accurate ways.

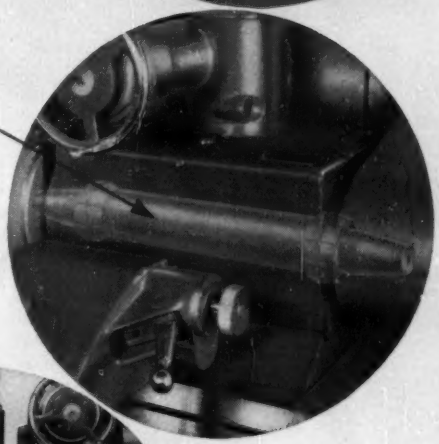
LANDIS

precision grinders

PRODUCTION

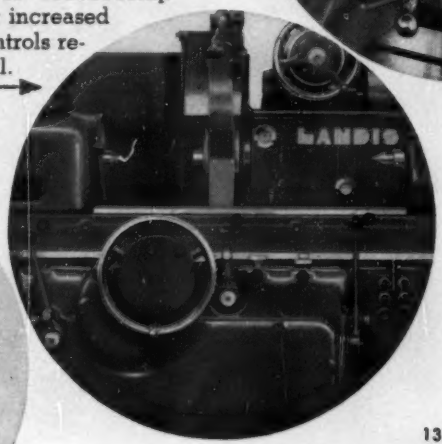
with LANDIS 10"-14" plain grinders

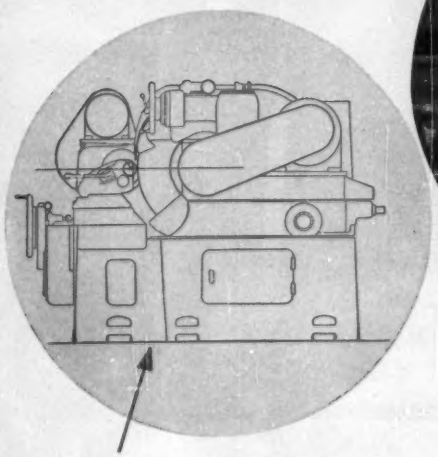
HYDRAULIC OPERATION Landis designed and built hydraulic system noted for simplicity of control and extra-smooth dependable operation.



MICROSPHERE WHEEL SPINDLE BEARINGS plus heavy duty wheel spindle proved in use by over 10,000 successful installations.

CENTRALIZED CONTROLS reduce setup and operating time for increased production. Simple controls require less operator skill.





LOW WORK HEIGHT from floor to work centers shortens work handling time and reduces operator fatigue.

139

LANDIS TOOL COMPANY / WAYNESBORO, PENNA. / U. S. A.

Flame-hardened and ways are standard

• Here, a skilled G&L craftsman, using G&L developed equipment, flame-hardens ways for a 30 Series machine. The greater hardness helps maintain the higher, longer-lived machining accuracy you get with G&L machines.

precision-ground on the G&L 30 Series

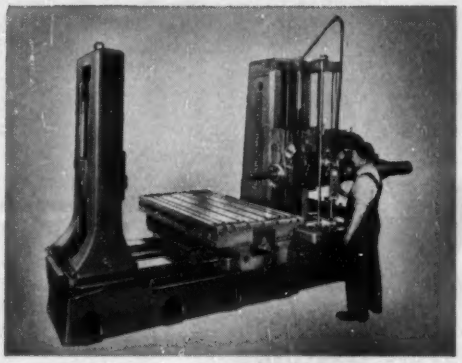
Hardened and ground bed and saddle ways are only one of the many plus features that are standard equipment on the G & L 30 Series table type Horizontals

IF you're searching for a horizontal boring, drilling and milling machine to handle large or small work, simple or complex set-ups, long or short runs — it will pay you to find out about the G&L 30 Series.

You'll discover that 30 Series machines allow you to perform boring, drilling and milling with equally high efficiency. You'll see, too, that no other machine on the market today offers you so many distinct performance and capacity boosting features as standard equipment.

Here are only a few of them — 45 all-geared spindle speeds in fine increments, 36 feeds, positive gear drive for heavier cuts, rapid change of feeds and speeds with full horsepower in the higher speed ranges.

Your investigation will convince you that a 30 Series machine is in a class by itself — often copied, never equaled. For complete details, see your G&L representative or write for the new 30 Series catalog.



There are two basic models in the 30 Series — the 340-T with 4" spindle and 20 hp, the 350-T with 5" spindle and 25 hp. Both machines offer a choice of three basic arrangements of table and saddle.

Hardened ways for bed and saddle are micro-finish ground, feature exceptionally accurate alignment.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools

If WEAR *is a factor...*

...use VK CARBIDE PLUG GAGES

TUNGSTEN CARBIDE
wire type .016" to .500" diameter
CHROME CARBIDE
taper insert type .500 to 1.510" diameter

In addition to its regular line of tungsten carbide wire type plug gages from .016" to .500" diameter, The Van Keuren Company now offers a new line of chrome carbide taper insert plug gages in the range from .500" to 1.510" diameter.

Van Keuren tungsten carbide wire type gages have proved their worth on thousands of tough gaging jobs. The new chrome carbide taper inserts (Carboloy, grade ‡608*) promise to be equally effective. Wearing qualities of chrome carbide are comparable with tungsten carbide. In addition, the material is lighter than tungsten carbide and has a coefficient of expansion close to that of steel . . . both of which factors are a distinct advantage in the larger sizes.

* Trademark of the Carboloy Dept. of General Electric Company.

Finish on Van Keuren gages in either tungsten carbide or chrome carbide will average .5 RMS or better. These gages are available in Class Y, X, and XX accuracies at moderate prices and on a reasonable delivery basis.

Send for a copy of the 220-page Van Keuren Catalog and Handbook No. 35 containing valuable technical and engineering information on measuring problems and methods. Address: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

35th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

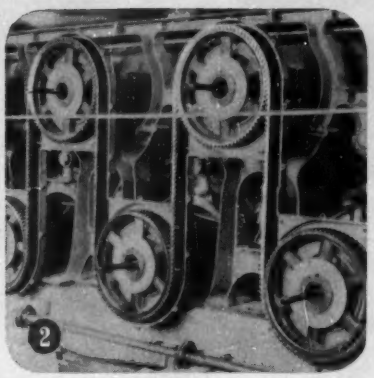
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

If you're designing for jobs like these--

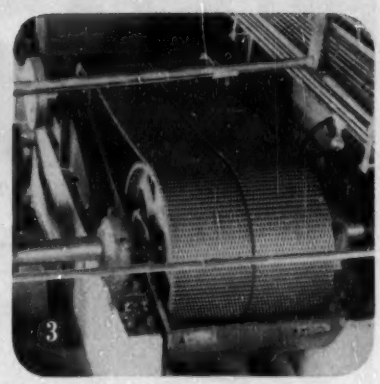
YOU'RE MONEY AHEAD

with LINK-BELT Silent Chain

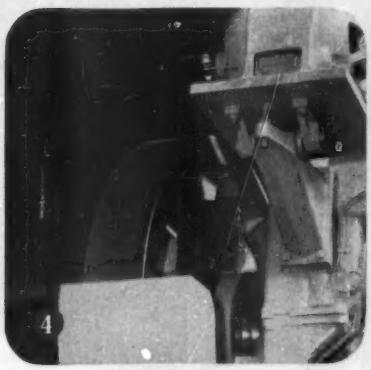
1 ADVERSE OPERATING CONDITIONS. Humidity, heat, cold do not lower Link-Belt Silent Chain's better-than-98% efficiency.



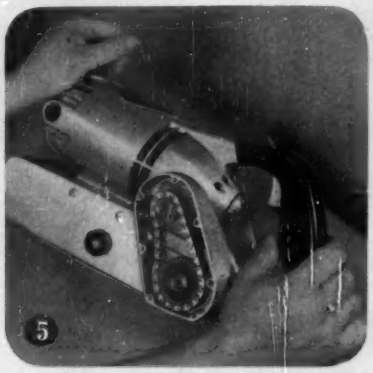
2 ACCURATE TIMING is assured for this paper dryer by Link-Belt Duplex Silent Chain. All shafts travel at uniform angular velocity for precise coordination.



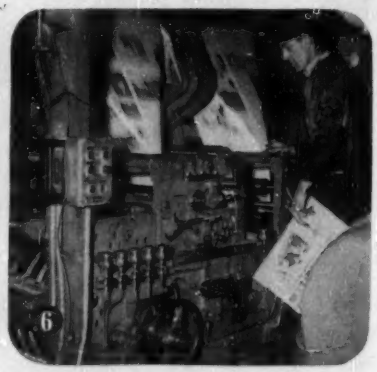
3 LARGE OR SMALL HP. A versatile line, Link-Belt Silent Chain drives are available from fractional to thousands of horsepower.



4 LARGE RATIOS. Link-Belt Silent Chain operates efficiently on extremely short centers at ratios as high as 10-to-1.



5 LIMITED SPACE is no problem for Link-Belt Silent Chain as shown by this 3/16-in. pitch portable belt sander drive.



6 HIGH SPEED. After 13 years on this newspaper press at speeds up to 4700 fpm, Silent Chain is still efficient.

Here's why Link-Belt Silent Chain Drives offer design engineers more per dollar spent:

- Lower cost—often lower in first cost, always lower in ultimate cost.
- Longer life—trouble-free performance for 25 or 30 years is common.
- No dismantling machine or removing sheaves for repairs.
- Better than 98% efficiency.
- Maintained ratio assures full productive capacity.
- Slipless action assures a better product.
- Easy to install.
- Safe to employees—operates in oil-retaining casing.

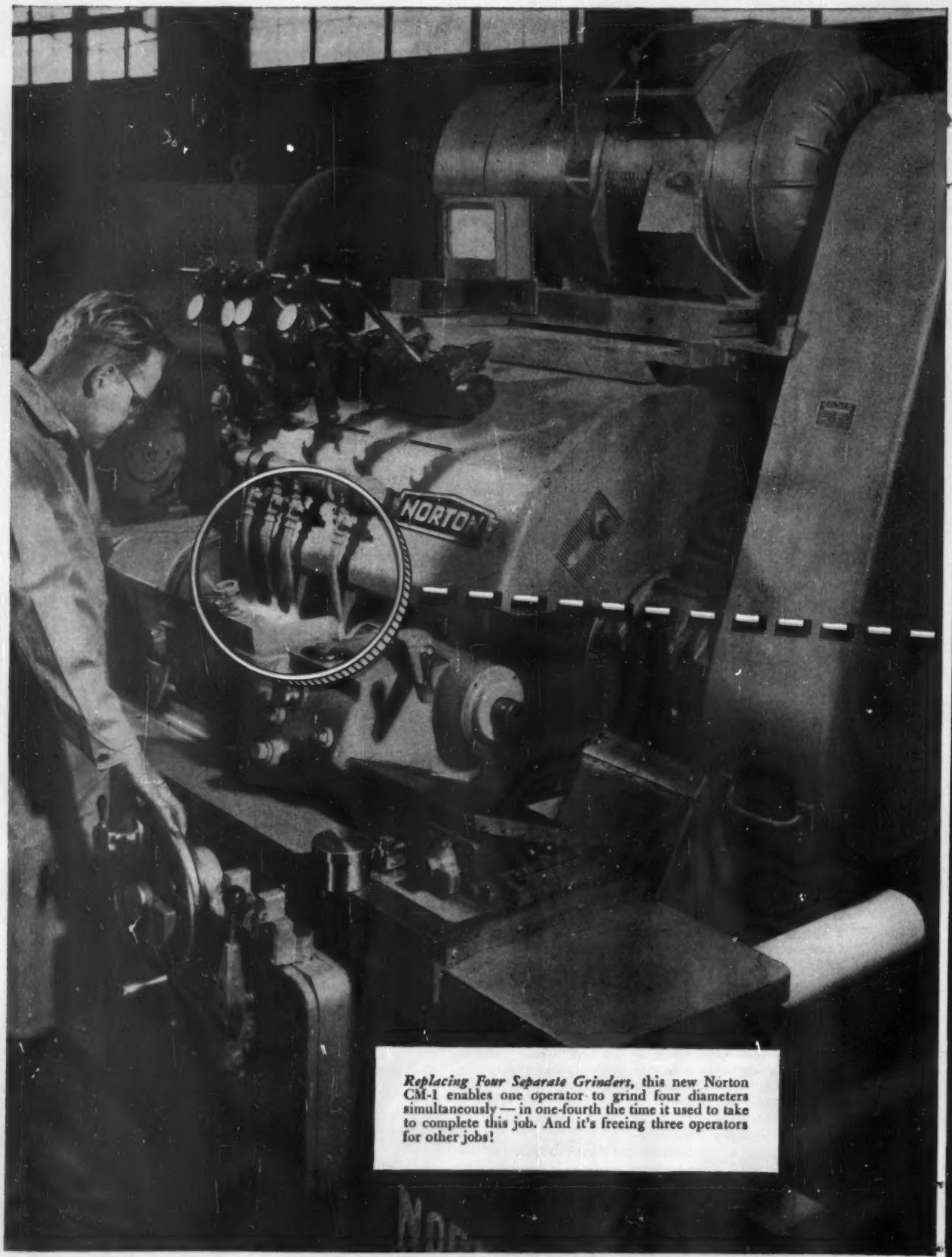
For complete design information, see a Link-Belt engineer, or write for your copy of new Book 2425.

LINK-BELT

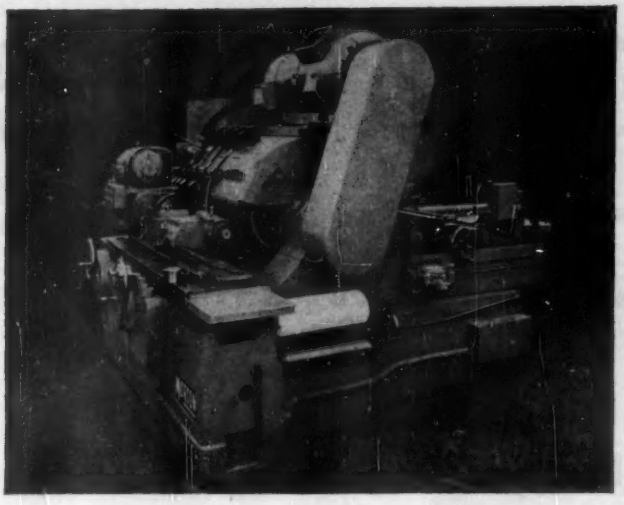
13,448-A

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Sydney; South Africa, Springs. Representatives Throughout the World.



Replacing Four Separate Grinders, this new Norton CM-1 enables one operator to grind four diameters simultaneously — in one-fourth the time it used to take to complete this job. And it's freeing three operators for other jobs!



A Great New Production Tool. The Norton Type CM-1 Heavy Duty Semi-automatic Multi-Wheel Grinder brings new efficiency and economy to the grinding of parts having multi-diameters—such as crank and cam-shafts, transmission and motor shafts, etc.

Here's a new Norton Grinder to

boost your production rate

400% or higher

Type CM-1 Heavy Duty Multi-Wheel Grinder does four or more jobs at once, reduces capital investment, cuts operating time and costs

When you can get one machine that does the work of several, in a fraction of the working time, you save considerably on purchase costs, on operating costs, and on floor space.

That machine is now ready to go to work for you. The new Norton CM-1 makes four or more cuts in a single plunge-grind cycle, operating automatically under one-lever control. And it completes each separate grinding operation with the accurate, trouble-free performance that's built into every Norton grinding machine.

Typical Advanced Features

- Cartridge type bearings at each end of heavy, 12"-diameter wheel spindle assure extreme rigidity of spindle, longer wheel life, greater accuracy and control with minimum truing.
- **Automatic truing device — in rear, out of operator's way — trues straight or formed wheels each individually, yet all at once, thus requiring only the amount of time needed to true widest wheel.**
- Automatic compensation for collective wheel wear, including amount trued off. No adjustment or resetting of wheel needed after truing.
- **Optional equipment includes built in automatic sludge remover and coolant filter, constant peripheral wheel speed control, increased power for wheel or work drive, etc.**

Why not get the complete story of how the CM-1 can benefit your grinding operations? See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to bring you the "Touch of Gold" — to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

When profits decline... bring costs in line with

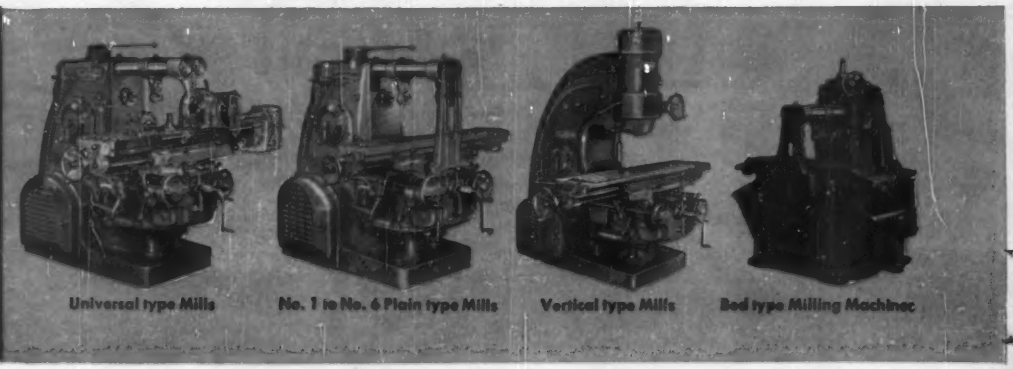
Kearney & Trecker's

TOOL-LEASE

PROGRAM

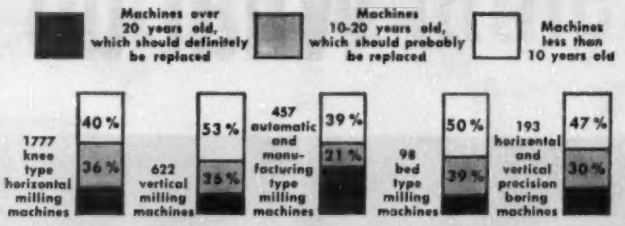
New Kearney & Trecker milling machines and precision boring machines...available for leasing...can help improve your competitive position and PROFITS

Kearney & Trecker manufactures a complete line of more than 250 standard knee and bed type milling machines and precision boring machines.



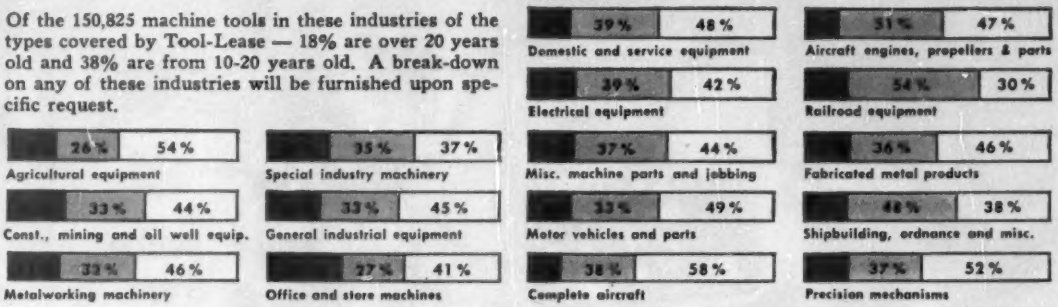
MACHINE TOOL OBSOLESCENCE IS BECOMING CRITICAL! WHERE DO YOU STAND?

Here's the picture in a typical basic industry—CONSTRUCTION, MINING & OIL WELL EQUIPMENT—(see chart at right). Of the 3300 standard knee type horizontal, vertical, bed and manufacturing type milling machines and precision boring machines in use today — *which could be replaced by Tool-Lease* equipment — 33% are 10-20 years old, 23½% are more than 20 years old!



HERE'S THE OVERALL PICTURE IN THE ABOVE AND 15 OTHER BASIC INDUSTRIES

Of the 150,825 machine tools in these industries of the types covered by Tool-Lease — 18% are over 20 years old and 38% are from 10-20 years old. A break-down on any of these industries will be furnished upon specific request.


39% 48% Domestic and service equipment
31% 47% Aircraft engines, propellers & parts
39% 42% Electrical equipment
54% 30% Railroad equipment
26% 54% Agricultural equipment
35% 37% Special industry machinery
37% 44% Misc. machine parts and jobbing
36% 46% Fabricated metal products
33% 44% Const., mining and oil well equip.
33% 45% General industrial equipment
33% 49% Motor vehicles and parts
48% 38% Shipbuilding, ordnance and misc.
32% 46% Metalworking machinery
27% 41% Office and store machines
38% 58% Complete aircraft
37% 52% Precision mechanisms

Figures for this presentation adapted from 1953 McGraw-Hill survey of metalworking industry.

TOOL-LEASE — A COMMON-SENSE APPROACH TO PLANT MODERNIZATION

Kearney & Trecker's Tool-Lease Program offers operating management a way to stop the trend of rising costs, increasing competition and shrinking profit margins. With Tool-Lease, you can enjoy optimum flexibility to meet changing production requirements while avoiding the risk of high obsolescence. What's more, Tool-Lease provides a way to keep your plant modern without tying up working capital.

TOOL-LEASE OFFERS A CHOICE OF PLANS TO MEET INDIVIDUAL NEEDS

Under Tool-Lease, you can rent any of the standard Kearney & Trecker *knee or bed type milling machines or precision boring machines.* All are available under three basic plans, with varying options to continue or terminate the lease or to purchase the equipment. If you require special machinery or heavy-duty CSM bed types, special agreements will be considered.

GET ALL THE FACTS NOW

For complete information on Tool-Lease . . . help in analyzing your milling and/or precision boring needs — see your Kearney & Trecker representative or mail coupon to Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

TOOL LEASE
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS
EQUIPMENT ®

©1954

Kearney & Trecker Corporation
6784 W. National Ave.
Milwaukee 14, Wis.

Please send me Bulletin TL-10A with details on the Tool-Lease Program or call Milwaukee, GReenfield 6-8300.

Name.....

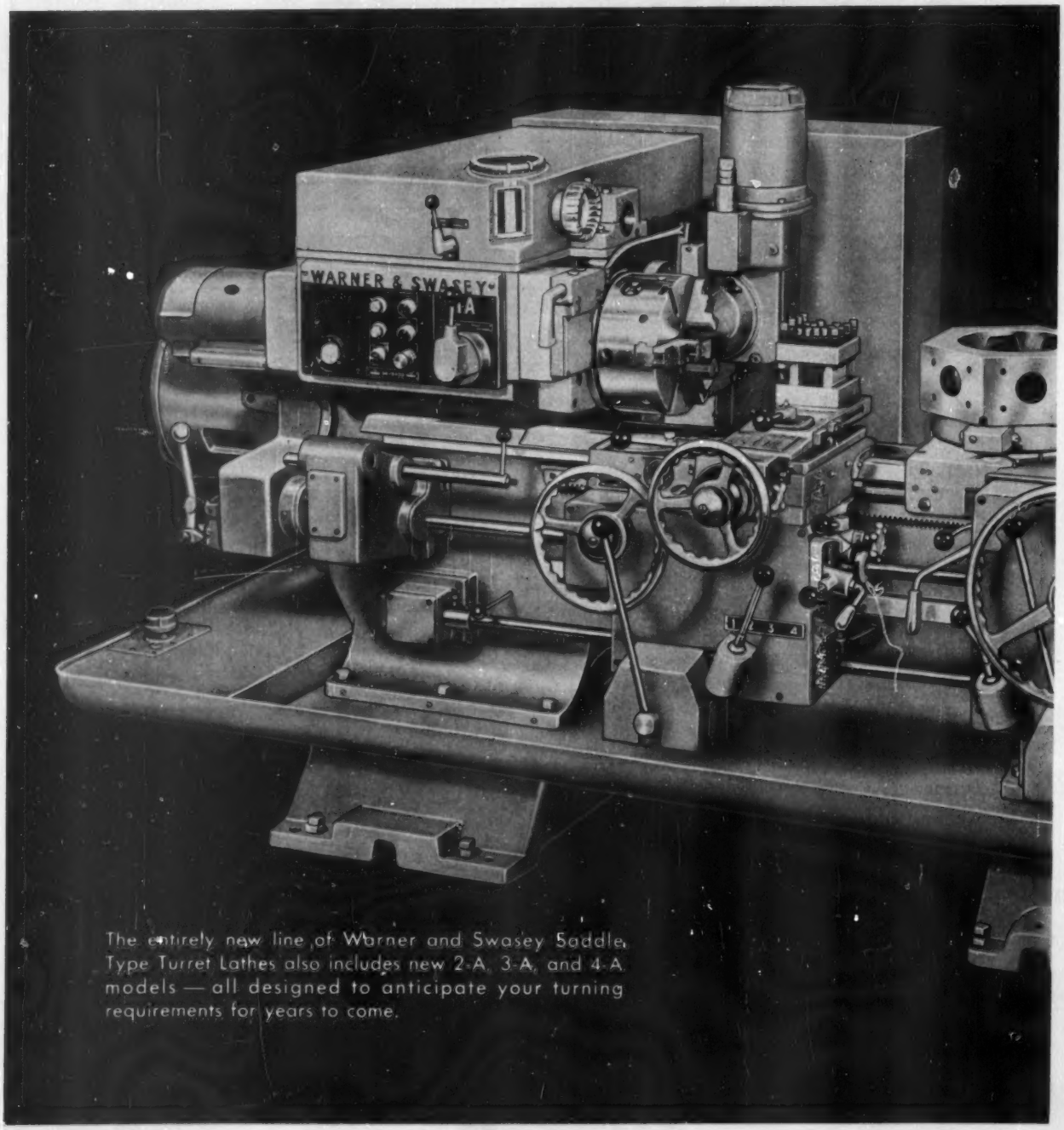
Title.....

Company.....

Address.....

City.....Zone.....State.....

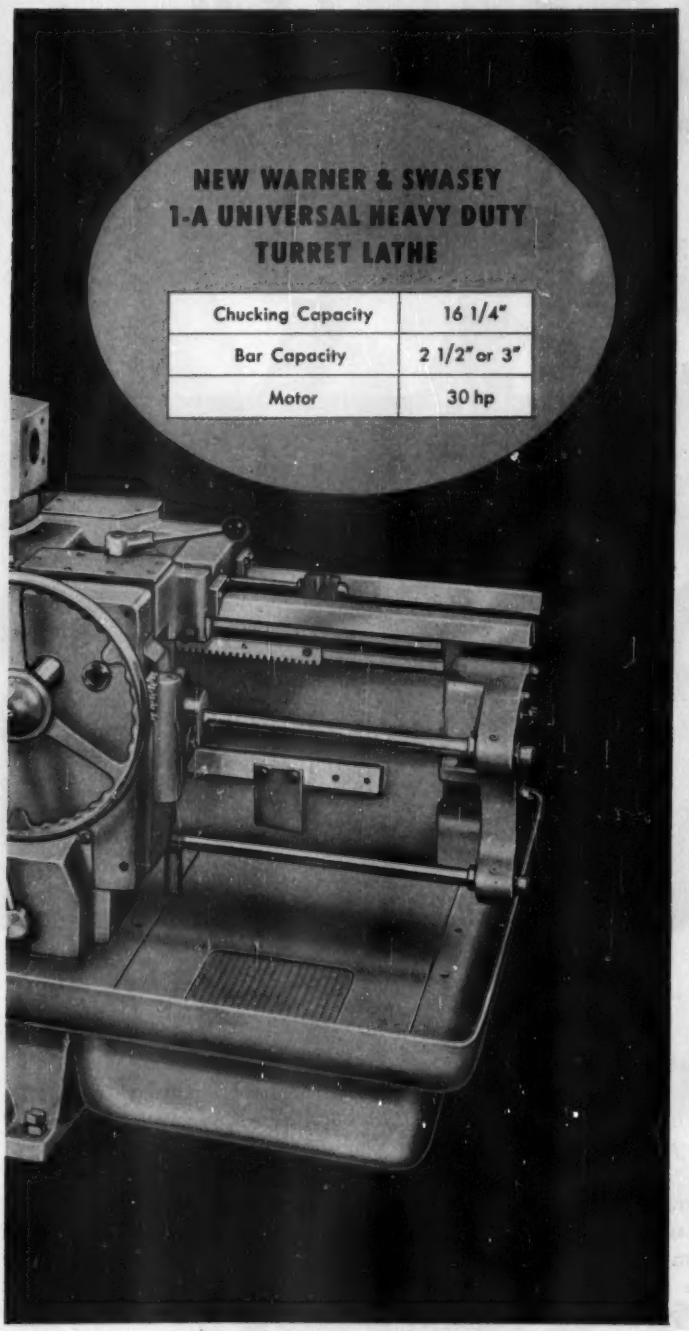
What do you want in



The entirely new line of Warner and Swasey Saddle Type Turret Lathes also includes new 2-A, 3-A, and 4-A models — all designed to anticipate your turning requirements for years to come.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

TOMORROW'S turret lathe?



MORE USABLE CUTTING SPEEDS?
New Warner & Swasey 1-A has them!

16 spindle speeds give you a closer grouping of speeds in the natural work range—to turn more work diameters at ideal speeds, increase production and tool life. And with a two-speed motor the 1-A gives you 32 un-duplicated speeds!

ABILITY TO TURN TO CLOSER LIMITS?
New Warner & Swasey 1-A has it!

Scientific diagonal-rib-designed bed provides greater rigidity without additional weight. Self-aligning and induction hardened Vee bedways, protected by way covers, assure long accurate life. Positive locating and locking hex turret also gives you greater accuracy.

MORE POWER?
New Warner & Swasey 1-A has it!

15 to 30 horsepower motors give you more than enough power for any job. They drive a unique, constant-mesh power train with direct-acting hydraulic clutches to handle all speed changes. Eliminates gear shifting completely.

SIMPLER OPERATING CONTROLS?
New Warner & Swasey 1-A has them!

A single lever controls all speed changes—eliminates all gear shifting. Pre-selection of next speed simple with large indicator dial. *Zoned controls* for headstock and both apron units are grouped within easy reach—designed for easier, faster operation, less operator fatigue, increased production!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

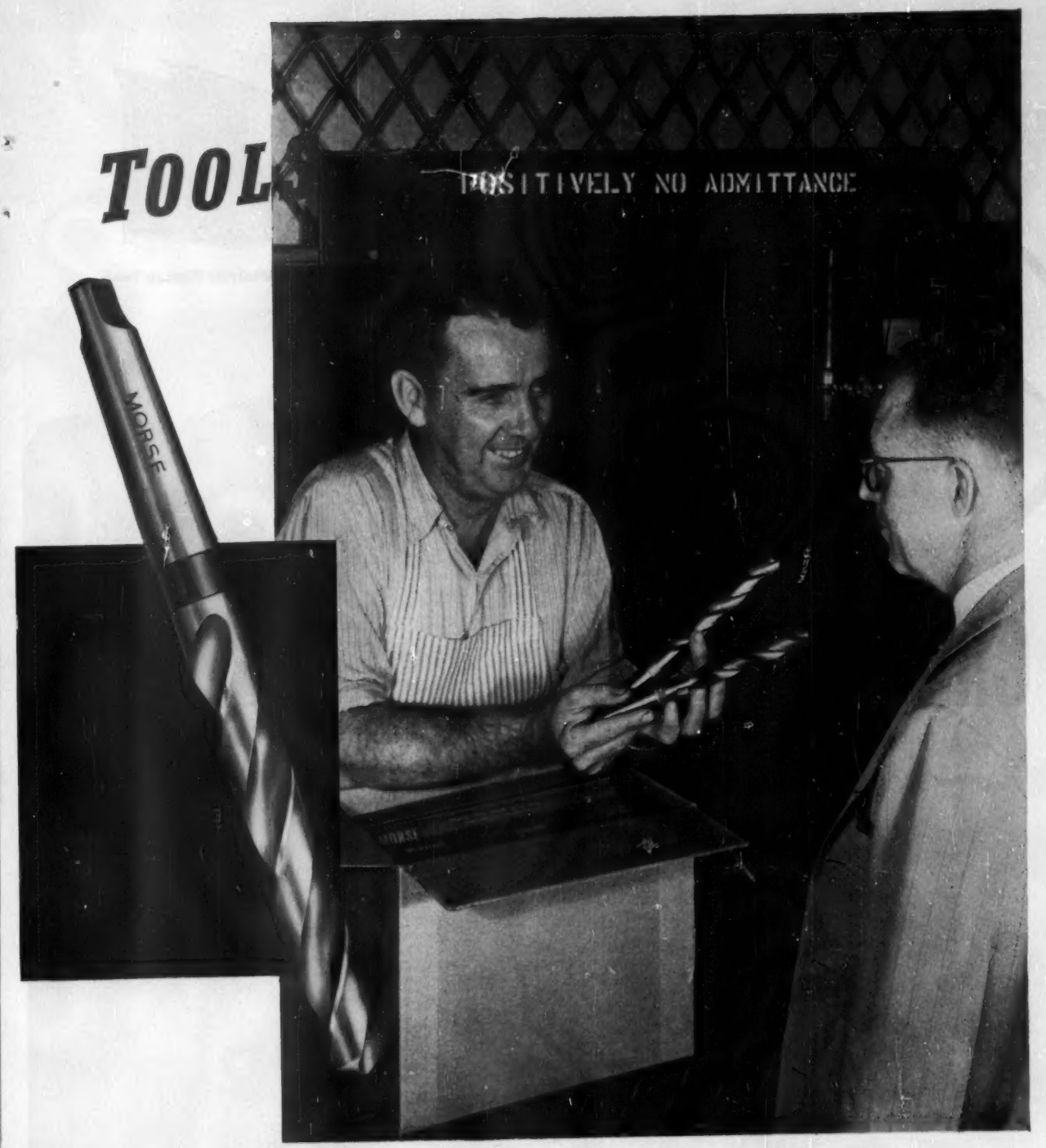
"It all adds up to this:
MORSE ELECTROLIZED
are the least expensive tools you can buy!"

The tool-crib boss never loses a chance to remind the works manager that: "Every new shipment of Morse Cutting Tools that comes into the plant *pays another bonus in plus-production!*"

That's right. For what Morse Tools *really* cut are *costs* . . . by cutting cleaner and faster . . . by staying on the job longer. And then, of course, to go even further and get the unmatched maximum in tool-life, *specify* Morse Electrolized Tools.

Whatever you need, in standard or special-purpose tools contact your Morse-Franchised Distributor. He'll work out the exact specifications that will give you top performance *on your particular job,* at lowest cost. He has the know-how and the assistance of Morse Engineers to solve any tooling problem.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASS.
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

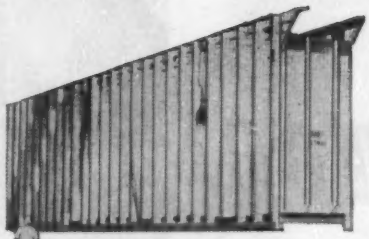


MORSE

Cutting Tools

...buy them by phone from your Morse-Franchised Distributor and save ordering time

• Roll Tables for Steel Mill



• 30-Ton Electrolytic Plating Tank

do it... on a versatile, accurate Cincinnati Press Brake

At Charles T. Brandt, Inc. speed, accuracy, and versatility are necessary to take care of large or small work in jobbing or production quantities.

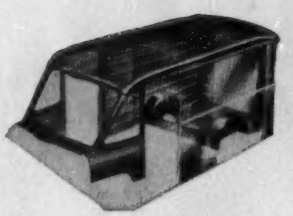
Write for the New 72 Page Catalog B-4, describing operations, features, and special arrangements including wide beds and rams, bed and ram extensions, deeper gaps, higher die space and other features.

CINCINNATI

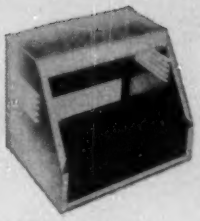
THE CINCINNATI SHAPER CO.

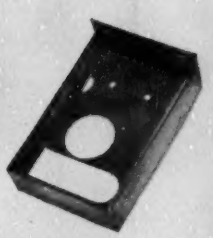
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

• Control House for Steel Mill

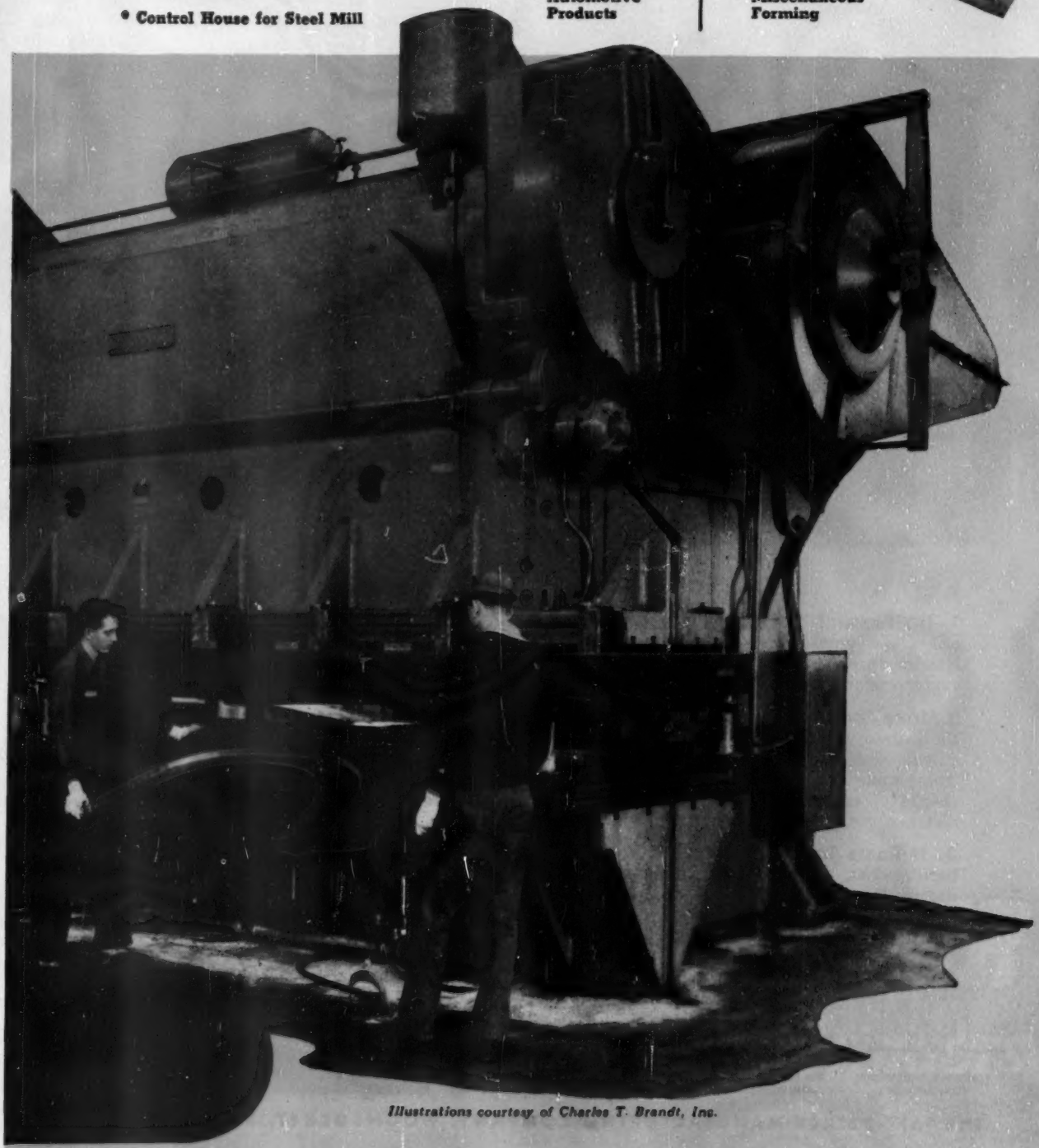


• Automotive Products





• Miscellaneous Forming



Illustrations courtesy of Charles T. Brandt, Inc.

Before You Buy any Air-Gage

you should know these 4 facts about a T-P CompAIRator

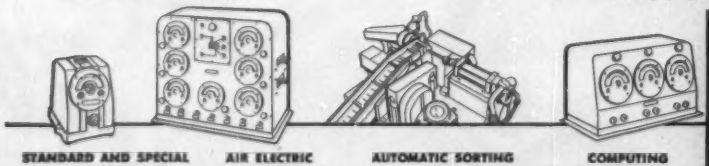
1. It's Faster! There's no flutter nor falling off of the pointer. No guesswork required. Readings are virtually instantaneous *even when long extension hoses are used.*

2. More Versatile! No other air gage matches the instant accuracy of this velocity-type circuit for such a wide variety of applications — from simple internal diameters to simultaneous checks of concentricities, squareness, center distance, etc. — bellmouth or barrel shapes.

3. It Costs Less to Operate! Vibration, hard knocks, jarring — even tilting — do not disturb the accuracy of a T-P CompAIRator. Its rugged construction eliminates expensive maintenance.

4. It Has A Wider Range! A T-P CompAIRator can be simply, quickly applied to check any dimensional relationship — even down to internal diameters as small as .055" . . . tolerances from .0001" to .120". No other air gage approaches this range. It means wider application, greater usefulness, more gaging for your money.

Before you buy any air gage you'll want to talk over these advantages with a Taft-Peirce sales engineer. Discover the dollars and sense savings a T-P CompAIRator can make for you. Write today. (And ask for descriptive Handbook.)



STANDARD AND SPECIAL COMPAIRATORS | AIR ELECTRIC COMPAIRATORS | AUTOMATIC SORTING MACHINE | COMPUTING COMPAIRATORS

T-P means Top Precision

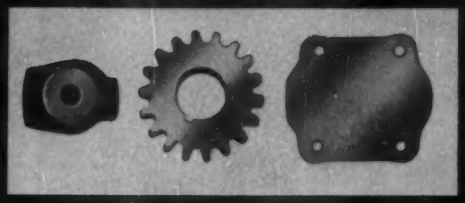
T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

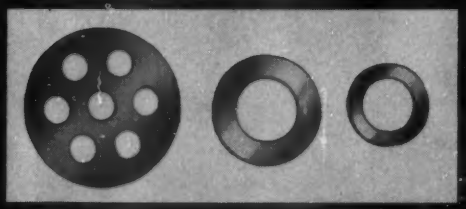
DUAL FIXTURING
Solves Grinding Problem

TWO Surfaces Ground in ONE Operation

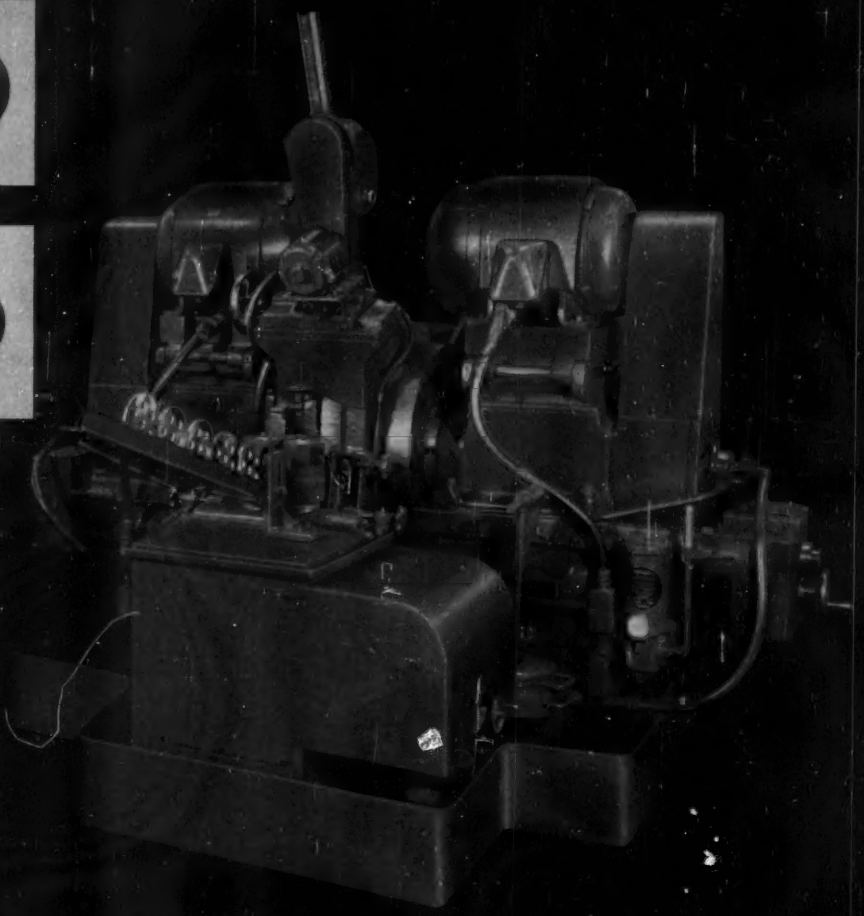
Wide variety of parts now ground on one machine



With rotary work carrying fixture



With feed-thru fixture



128M

JOB DATA

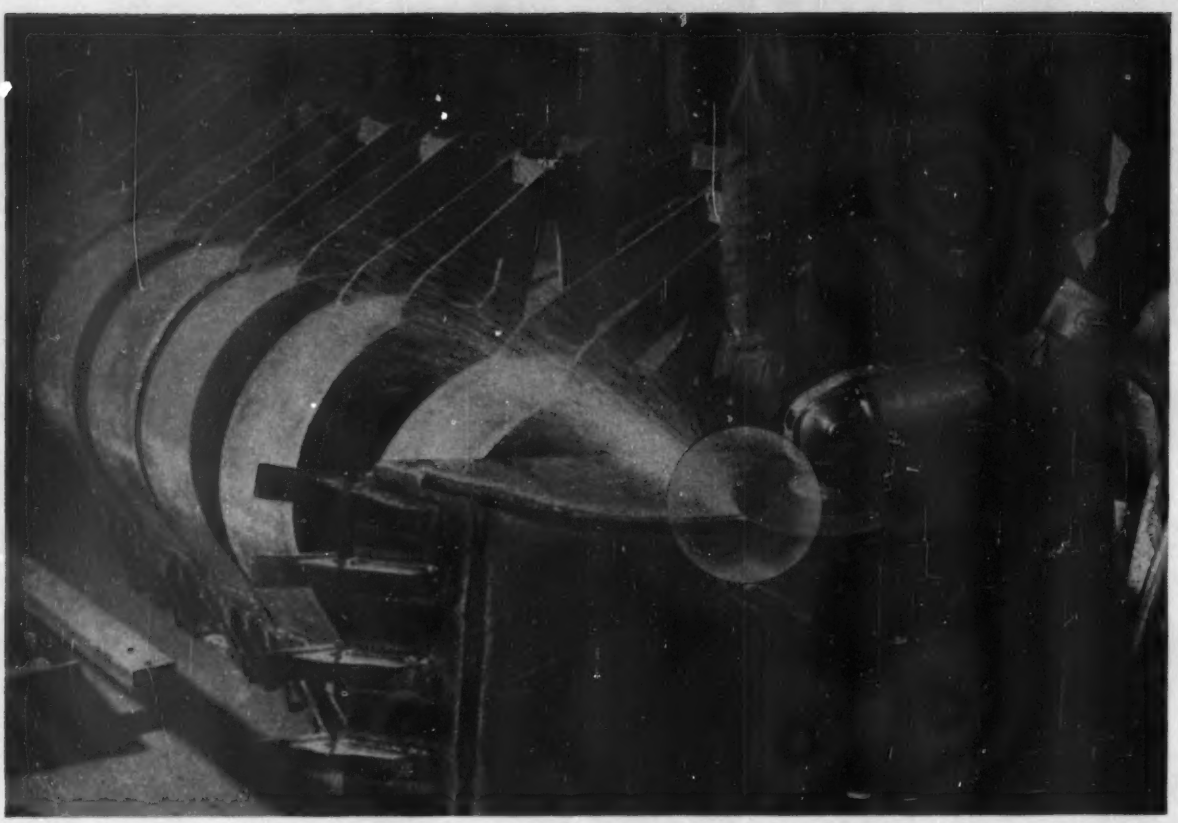
MACHINE	Gardner 128-26" Precision Double Spindle Grinder
TOOLING	Rotary Work Carrying Fixture on Front Feed-thru Fixture on Rear (illustrated)
PRODUCTION	On pieces (illustrated), 30 to 50 pieces per minute, .030 to .075" overall stock removal
TOLERANCES	.0005" for flatness and parallelism; .002" for uniformity
WORK HANDLED	Rocker brackets, Crankshaft spacers, Crankshaft sprockets, Thrust washers, Timing gear sprockets, Pump covers

If you need fast, economical production of flat surface parts, send us blueprints for production estimates and tooling suggestions.

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wisconsin, U.S.A.

GARDNER
Grinders

precision disc



The BD is the preferred hub-type wheel for heavier stock removal. Ideal for smoothing and blending welds on fabricated work; smoothing flame-cut edges and stainless steel welds; cleaning between teeth of gear castings; many slotting, notching and cutting-off operations.

4 Great Team-Mates for your "TOUCH of GOLD"

Norton REINFORCED WHEELS add value, cut costs, on hundreds of grinding jobs

Here's The Line-Up

BD Rigid hub-type, resinoid bonded. Glass cloth reinforcement for high strength plus the Nylon layer add up to extra hub-wheel safety. For the more severe jobs on your right angle grinders.

BFR Semi-flexible hub-type, resinoid bonded. Cotton fabric reinforcement with the additional layer of Nylon. For better finish and contour blending.

BF Semi-flexible straight wheel, resinoid bonded. Cotton fabric construction similar to the BFR but without Nylon reinforcement. For periphery grinding only. An excellent deburring and finishing wheel. Also available in mounted wheels and points and in hand sticks.

BN Straight wheel, resinoid bonded. Glass cloth reinforcement, as in the BD. Provides very high resistance to breakage in a wide range of cutting-off and other jobs.

Add outstanding versatility to strength and to safety, multiply the result by four and you have one reason why this Norton team rates as the "Big 4" among reinforced wheels.

Separately, each handles a considerable number of important grinding jobs. Together, they cover an almost endless list of applications, ranging from light deburring to severe cutting-off. And they do every one of these jobs with the *extra* safety, service life and economy that add the real "Touch of Gold" to your grinding operations.

Your Norton Distributor

will be glad to demonstrate Norton Reinforced Wheels in your shop, and to aid you in any grinding problem. Or write to NORTON COMPANY, Worcester 6, Mass. for the Brand New Catalog on Reinforced Wheels. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. W-1551

NORTON
ABRASIVES

Making better products... to make other products better

The BFR is outstanding for light snagging, light weld grinding, smooth finishing, blending contours and corners, removing mold marks, removing rust and scale; and scarfing and beveling before welding. Also for notching gates and risers.

The BF, a straight wheel version of the BFR, is the wheel to use for light deburring, breaking edges on machined work, taking off flash from plastic parts, removing light welds and many other miscellaneous light portable and bench grinding applications.

The BN is the recommended cut-off wheel wherever great strength and safety are vital. Excels at cutting-off non-ferrous gates and risers and various non-metals. Its range also includes cutting wire rope, slotting rails, tuck pointing, etc. Small sizes are popular on small portable grinders.

BF Mounted Wheels and Points, like all Norton mounted wheels and points, are trued on their own spindles. Having the same laminated construction as the larger BF wheels, they are designed for such jobs as finishing plastic molds, glass molds, forging dies, etc. For hand finishing, use BF sticks.

the hole story on

REAMERS

is service and control

accurate size, selective finish, maintenence, sharpening

. . . all are important to the number and quality of holes you ream. Singly or together, these factors control the cost and cutting life of your reamers.

Barber-Colman Reamers are designed and built to furnish you with control over all factors at all times. A highly trained reamer service organization responds promptly to your requests for assistance on special reaming problems.

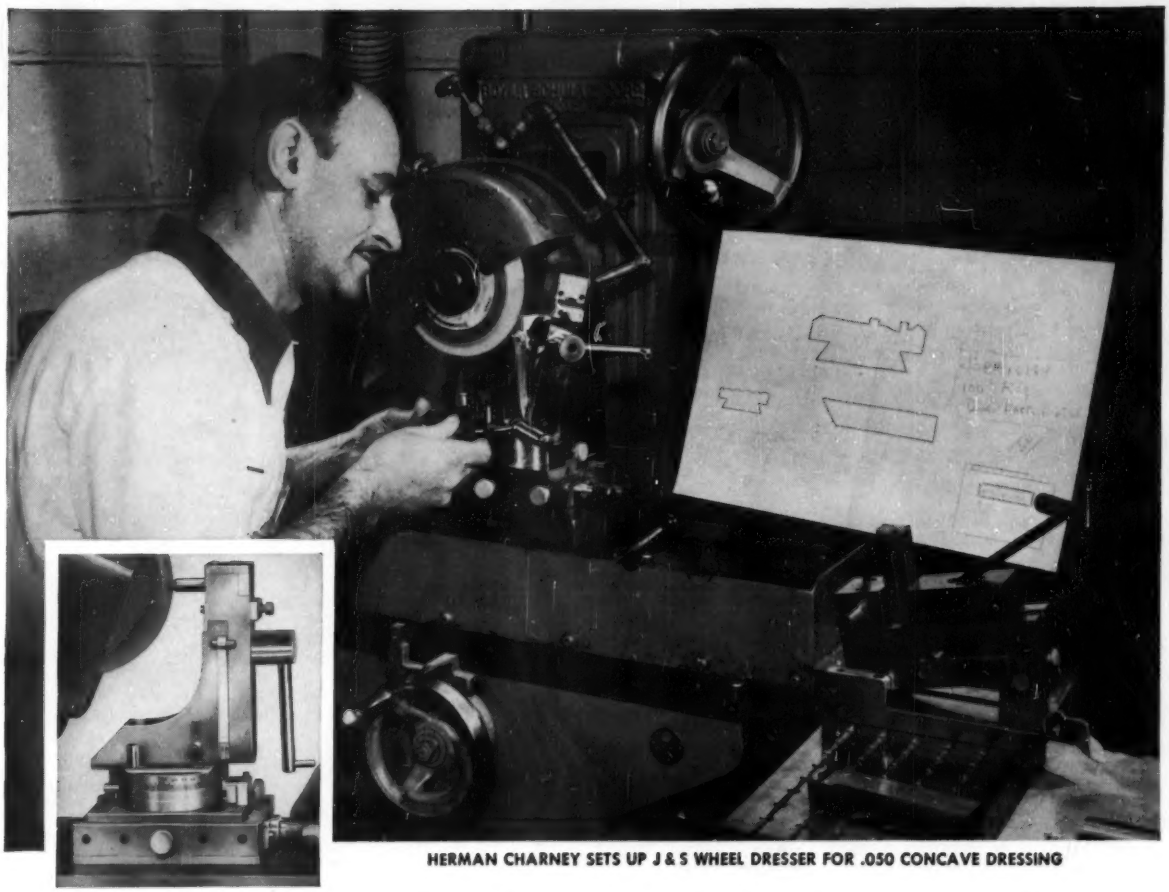
Barber-Colman Reamers give you both . . . service and reamer control. Send prints for recommendation and specifications.

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 115 ROCK STREET, ROCKFORD, ILLINOIS

pioneers in reamer design
reamer finishes
reamer sharpening



HERMAN CHARNEY SETS UP J & S WHEEL DRESSER FOR .050 CONCAVE DRESSING

Saves hours by setting angles in seconds, radii in minutes

A typical job made easier with a J & S "Fluidmotion" Wheel Dresser

Here's a wheel dressing job which calls for 13 angles, 4 radii, 7 flats. Ordinarily you might expect to spend from 5 to 30 minutes for each setting. With a J & S "Fluidmotion" Wheel Dresser, tool grinder Herman Charney made *all* 24 settings in just 21 minutes.

Time-saving Features

An unusual case? No — it's typical of the speed and ease of operating a J & S Wheel Dresser. Setting 2 angles with a "Fluidmotion" Dresser, for example, takes only 10 seconds. Setting a radius takes only 2-3 minutes.

Note just *how* easy it is to operate a J & S Wheel Dresser. All you need is a micrometer and a simple hex wrench. You can forget about gage blocks, height gages and master gage settings. No need to bother either with parallel bars, surface plates or dial indicators.

With the "Fluidmotion" Dresser, you can also dress two angles tangent to a radius in one continuous motion. After dressing the angles, the diamond automatically returns to center.

Accurate to 0.0001"

Accuracy? You can make concave and convex contours at a full 180 degrees with a guaranteed accuracy of 0.0001". J & S dressed forms, too, are always clean and precise. Angles and radii *flow* into each other, free of tool or chatter marks.

These are some of the benefits you get when you use a J & S "Fluidmotion" Wheel Dresser. A variety of models are available for dressing wheels up to 24" in diameter. Construction in all cases is of high-carbon, high-chrome steels.

Write for complete information today.

J&S TOOL CO., INC.

WHEEL DRESSERS • JAW CLAMPS • PRECISION VISES • SINE BARS • DOWN-HOLDING DEVICES

646 W. MT. PLEASANT AVENUE, LIVINGSTON, NEW JERSEY

Orchard Spraying, Berks County, Pennsylvania

Shostal Press Agency Photo

BULLARD

The Invisible Background of Industrial Progress

Modern farming methods, like modern industrial methods, use modern equipment to do the job better and faster. From the ox plow of our forefathers to the tractor with plow attachments, from the scythe to the modern reaper, from the hand hoe to the mechanized cultivator — these are just a few examples of the progress made in the farm equipment field which makes possible greater crops per acre with far less effort and time.

Modern Machine Tools are basic tools in the manufacture of mechanized farm equipment including tractors, sprayers, spreaders, cultivators and reapers — all truly, "The Invisible Background of Industrial Progress."

THE BULLARD COMPANY • BRIDGEPORT 2, CONNECTICUT

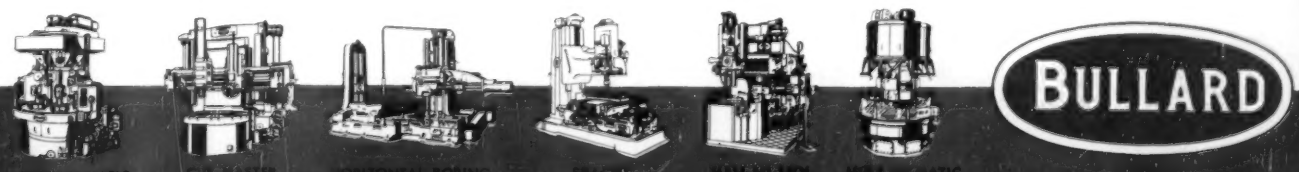
Bullard Horizontal Boring, Milling and Drilling Machine

Available in two sizes, 4" and 5" spindles with optional capacities

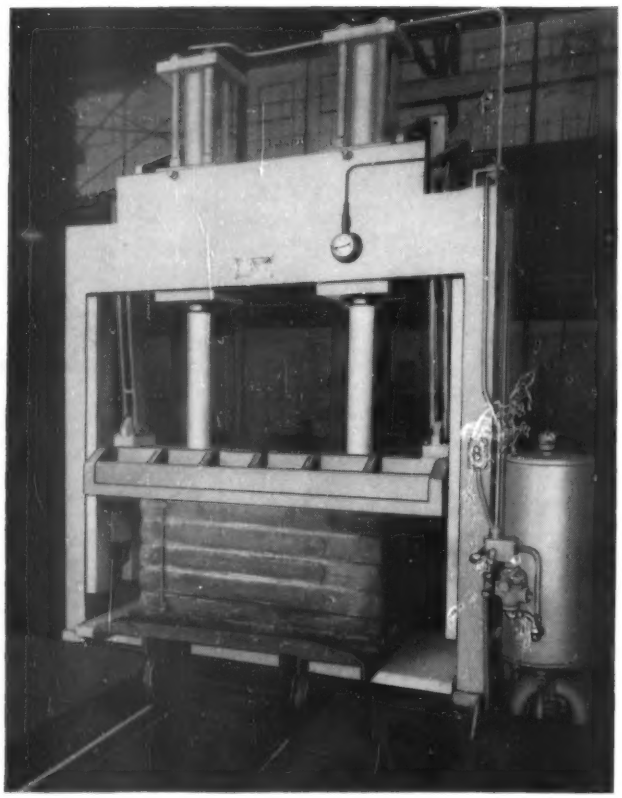
Can close machining tolerances be maintained on large, bulky pieces? Of course — if you use a Bullard Horizontal Boring, Milling and Drilling Machine.

Here is a typical application experienced by Combustion Engineering, Inc. of Chattanooga, Tennessee, manufacturers of high-pressure boilers. The total length of the piece to be machined is 11 feet 4-13/32 inches and the job consists of boring fifteen 4-inch holes in a row and then milling the ends. This was accomplished in four operations per hole, holding each hole within a tolerance of +.001"–.000. Total machining time — eight hours per piece.

If you are looking for a versatile, rugged, horizontal boring, milling and drilling machine with "built-in" accuracy and efficiency, investigate Bullard. Your Bullard Representative will explain its many features or, write to The Bullard Company, Bridgeport 2, Connecticut — phone 6-2511.



KRW PRESS UPS PRODUCTION 20% AT DUNKIRK RADIATOR!



THIS KRW 2-cylinder, motor-driven Hydraulic Press has increased production about one-fifth at Dunkirk Radiator Corp. It's used for pressing together 160 lb. cast iron boiler sections. The sections are cemented together, nippled, then pressed and tied with tie rods.

PLATEN SPEEDS PRODUCTION

Dunkirk officials tell us that this platen-type press is far superior to the press they were using. The platen is much steadier, can be slowly "inched" down to the work — but doesn't have to be guided. The press is accurate and rapid and the movement of the platen during the Press operation is much more stable.

ANY PRESSING PROBLEMS?

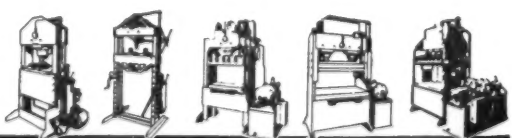
KRW has the right Hydraulic Press for you. We make a complete line; one, two and three cylinder models — all self-contained above ground; 25-150 ton capacities; hand, air or motor driven. Check your Machinery dealer or get in touch with us at Arcade, N. Y.

ONLY KRW GIVES YOU ALL THESE FEATURES:

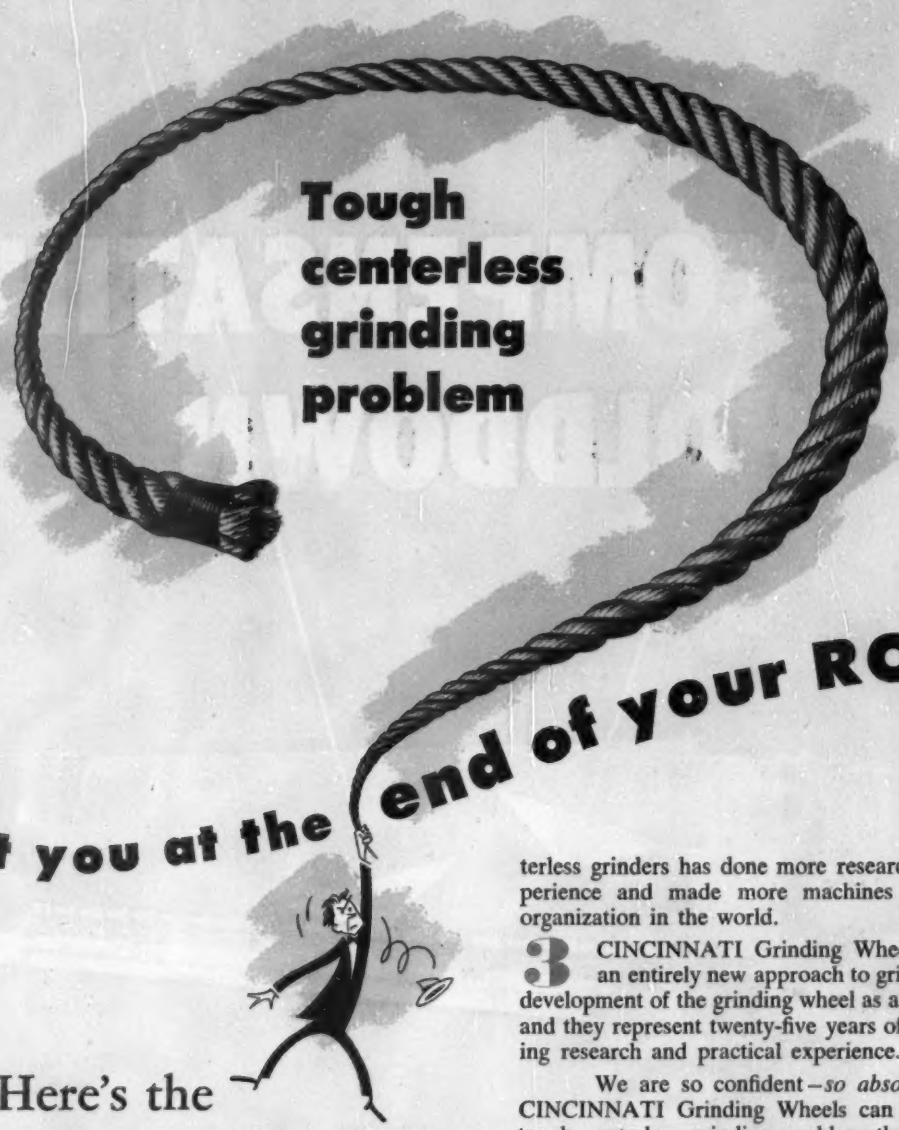
- **Heavy Construction Throughout.** Bed and Crown Members Truss Reinforced for Added Stiffness and Strength. A KRW Exclusive Feature.
- **Any Tonnage Pressure** up to Rated Capacity can be Obtained Quickly and Selected Pressure Locked for Repetitive Operations.
- **One Swinging Ball Arm** Controls Motion of Ram Downward, Holds Pressure on Work, or Returns Ram.
- **Excellent "Inching" of Ram** Because Motor Runs Only When Operator Moves Ball Arm for Downward Ram Travel.
- **Spring Return of Ram** Gives Maximum Speed on Up-Stroke.
- **Highest Quality** Radial Type Hydraulic Pump.
- **Direct Connected Motor Drive** Through Flexible Coupling.
- **Two Speed Hand Pump** also Furnished on Motor Driven Presses in this series.

K·R·WILSON

210 Mill Street, Arcade, N. Y.



Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!



got you at the end of your ROPE?

Here's the grinding wheel that will ABSOLUTELY solve it!

CINCINNATI Grinding Wheels can help you untie the knots in that tough centerless grinding problem: BECAUSE CINCINNATI WHEELS ARE MADE TO TEAM-UP WITH CENTERLESS GRINDERS!

And with a Cincinnati Milling-trained machinist on the spot to help you get the most out of CINCINNATI Grinding Wheels, you can count on the *right answer*—FAST!

Look at the reasons why we're so *positive* that CINCINNATI Wheels can help you:

1 We've solved hundreds of centerless grinding problems involving high stock removal, good finish, accurate sizing, and high production per dressing, by using the right CINCINNATI wheels.

2 CINCINNATI Grinding Wheels were developed by Cincinnati milling, which in the field of centerless grinders has done more research, had more experience and made more machines than any other organization in the world.

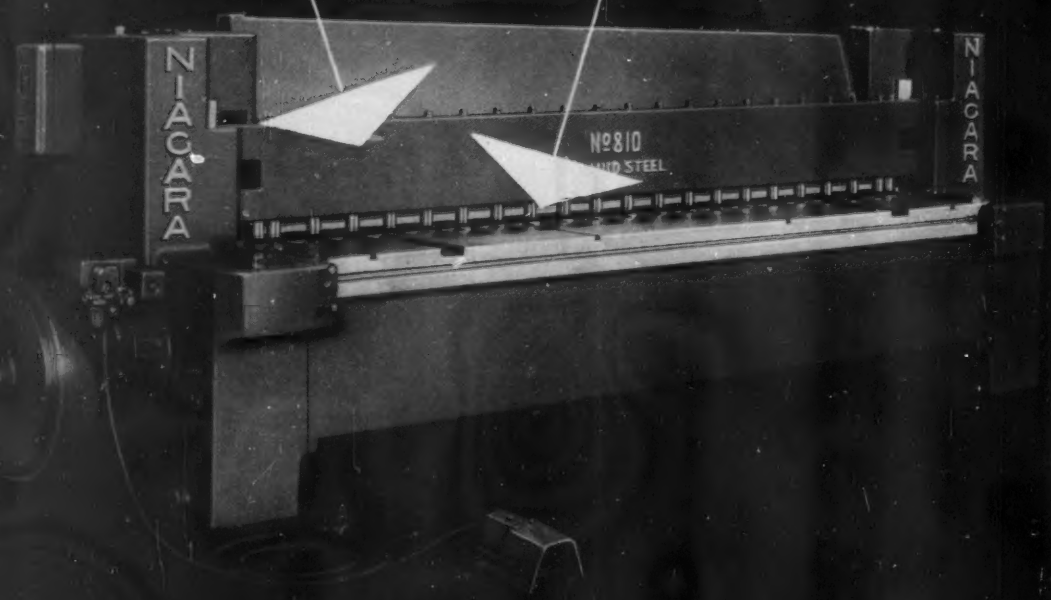
3 CINCINNATI Grinding Wheels are based on an entirely new approach to grinding wheels, the development of the grinding wheel as a true cutting tool, and they represent twenty-five years of Cincinnati Milling research and practical experience.

We are so confident—*so absolutely sure*—that CINCINNATI Grinding Wheels can help solve your tough centerless grinding problem that we make this *unconditional offer:* either you must be completely satisfied, or we will issue full credit for the CINCINNATI Grinding Wheel used.

So contact us at once. We'll send one of our expert machinists—men who are Cincinnati Milling-trained and know grinding and grinding machines as well as grinding wheels. He can show you how to get the most out of CINCINNATI Grinding Wheels and help you solve that tough centerless grinding problem. There is no charge for his service. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio

SELF-COMPENSATING HOLDDOWN



NIAGARA
MACHINE & TOOL WORKS
1879 75 1954

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

a BIG FACTOR in the superiority of Niagara Shears

"STRAIGHT-EDGE" CUTTING ACCURACY
Positive, power actuation grips work securely for maximum cutting accuracy.

LOW IMPACT AVERTS DAMAGE AND INACCURACY
Individual pressure feet contact work with low impact, thus safeguarding both the material and bed against damage, as well as reducing noise level. No hammer-blows to mar work. No peening of bed with resulting distortion of knife seat.

SIMPLIFIED, LOW UPKEEP DESIGN
Simplicity of design and construction, involving a minimum number of parts, assures negligible servicing. With *less* to go wrong, there is *less* to repair and replace.

HOLDS WORK FLAT AND STATIONARY
Multiple pressure feet on 6" centers, applying uniform pressure, hold work flat and tight against bed to assure utmost shearing accuracy. No rippling of sheet between feet as cut progresses. Firm grip on short pieces.

HANDLES STOCK OF VARYING THICKNESS
Individual feet are self-compensating, requiring no adjustment for cutting stock of different thicknesses . . . *even at the same time.*

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.
DISTRICT OFFICES: Detroit • Cleveland • New York • Philadelphia
Dealers in principal U. S. cities and major foreign countries

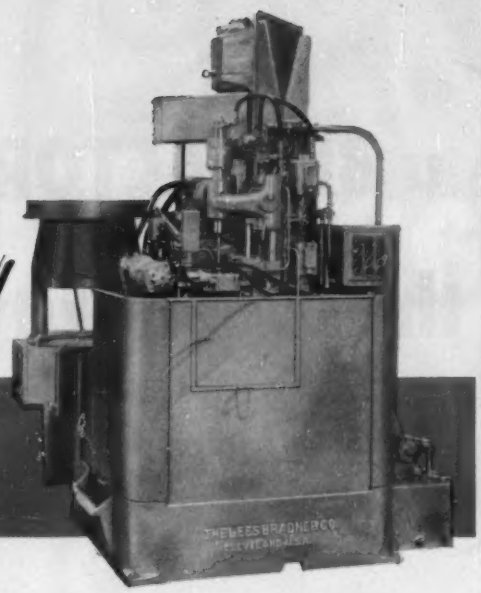
In a power squaring shear, no *single* feature nor component can be fully responsible for accuracy, speed and economy. *They* result from a *combination* of features such as the self-compensating holddown; rigid, fully closed box section construction of bed and crosshead; low slope of upper knife; ample and accurately held crosshead guides; multiple point sleeve clutch —the very features that have established the marked superiority of Niagara's Underdrive Series.

For the whole story, straightforwardly presented, on America's most complete line of underdrive power squaring shears, with capacities from shim stock to 1 in. thick mild steel (lengths 3 to 20 ft.), request *Niagara Bulletin 69.* Write today.

NIAGARA

UNDERDRIVE SQUARING SHEARS

Automation is here ...from blank to gear!



MODEL 7-A "AUTOMATIC" SINGLE-SPINDLE HOBBER

- 3" diameter, single-start hob
- Runs at 350 R.P.M.
- Feeds at .050" per revolution
- Hobs two pieces per load
- Hobs one gear tooth every 45 seconds
- 16 teeth in gear
- Face width of gear: ⅝"
- Loading and unloading time: 2 seconds

The famous Lees-Bradner 7-A single spindle hobber has now gone completely automatic!

From blank to finished gear the whole operation is "push-button". Here's how it works:

Blanks are fed from a Syntron Vibratory Feeder down a rack to an automatic pick-up arm or loader.

The loader picks up two blanks at a time and moves them to the hobbing position under an expanding mandrel. The mandrel holds the blanks while the hob moves forward automatically to commence the hobbing operation.

After the gears have been hobbed they are ejected by the loader as it sets the next two blanks in hobbing position.

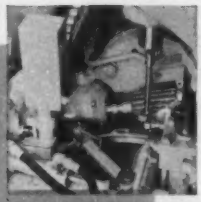
As a control measure, the machine will not operate if:

- **The blanks are not in the loader**
- **The blanks are not removed from the arbor**
- **There is not sufficient hydraulic clamping pressure**

In the operation pictured the machine is hobbing a pinion gear for an automatic transmission.

Write to the company for details on this amazing new automatic hobber.

1. Arbor retracted ready for loading.



2. Loader arm moves to right with 2 blanks.

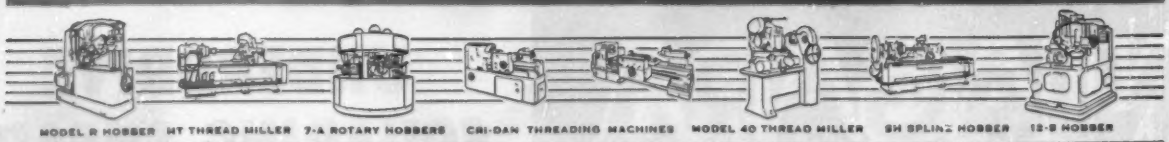
3. Loader about to eject finished gear from under mandrel.

4. Blanks held in place by mandrel ready for hobbing operation.

The Lees-Bradner 7-A Automatic Hobber is available in single units or quadruple mountings. (4 machines in line with common base, coolant tank, master control and feeder.)

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



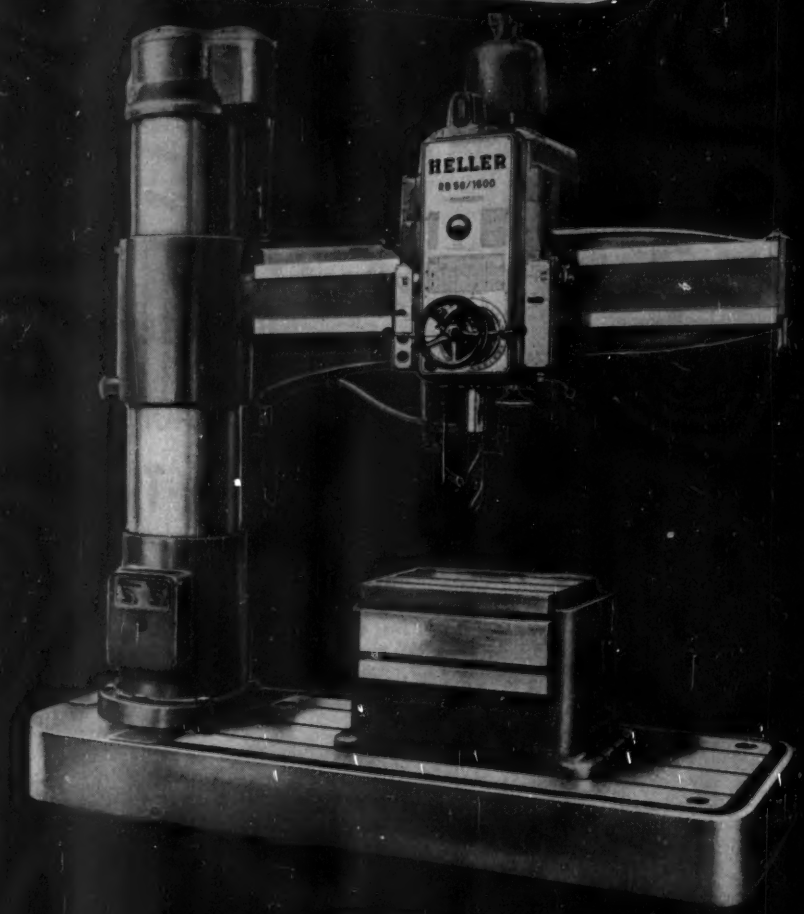
MODEL R HOBBER · MT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-B HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

Cut Costs and
Increase Efficiency with

HELLER

RADIAL DRILLING MACHINES



HELLER MACHINE CO.
114 Liberty St., New York 6, N. Y.

KNEE & PLANER TYPE MILLING MACHINES
COLD SAWING MACHINES • SAW SHARPENING MACHINES • SAW BLADES • TRANSFER MACHINES • SPECIAL MACHINES

Heller Radial Drilling machines are offered in 2½ foot, 4 foot and 5 foot arm types. Column is 16" in diameter and drive is by direct motor through multi-disc friction clutch. Gear change is simplified through preselector unit with automatic depth drilling and tapping switch. Arm raising and lowering and saddle adjustment is hydraulically locked as desired. Construction is complete with anti-friction bearings with special oil pump for saddle lubrication. In addition to Radial drills, we offer also Column Drilling Machines and Gang type drilling machines.

Importing Heller Machines Since 1926

The cheetah of East Africa . . . reputed to be the fastest animal on earth, has been clocked at sustained speeds of from 70 to 80 miles per hour.

SPEED!

Bath High Speed Steel Taps do a fast, accurate threading job! When conditions require sustained high speeds for top efficiency, they'll stand up . . . hole after hole — after hole.

The Bath process assures cutting teeth which are not adversely affected by extreme temperatures generated in high speed production tapping. In many cases, this permits the tap to be run at increased speeds.

Actually, each tapping job has an optimum speed at which the tap should be run for greatest overall economy. This optimum speed is dependent on conditions in your plant. The most important conditions are:

- the type of material to be threaded
- the type of lubrication to be used
- the type of equipment available

Check these conditions now! Pass the information on to the Bath engineering staff — and they'll recommend the optimum speeds for your production line.

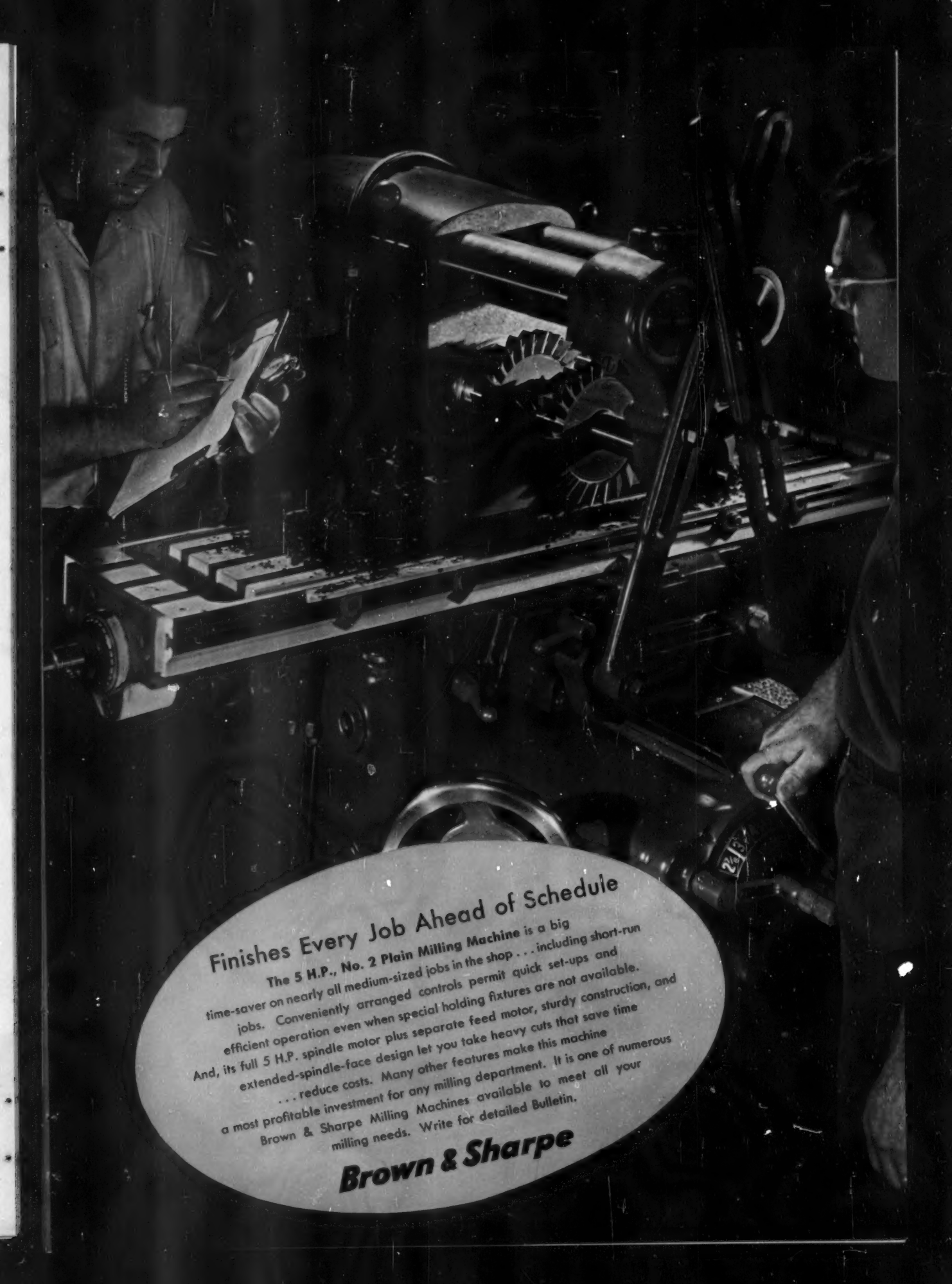
Bath engineers check every detail, to see that all Bath Taps are conditioned to do the best threading job for your requirements.

Insist on BATH TAPS for BETTER THREADS

JOHN BATH & CO., Inc.

22 Grafton St., Worcester, Mass.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS



Finishes Every Job Ahead of Schedule

The 5 H.P., No. 2 Plain Milling Machine is a big time-saver on nearly all medium-sized jobs in the shop . . . including short-run jobs. Conveniently arranged controls permit quick set-ups and efficient operation even when special holding fixtures are not available. And, its full 5 H.P. spindle motor plus separate feed motor, sturdy construction, and extended-spindle-face design let you take heavy cuts that save time . . . reduce costs. Many other features make this machine a most profitable investment for any milling department. It is one of numerous Brown & Sharpe Milling Machines available to meet all your milling needs. Write for detailed Bulletin.

Brown & Sharpe

Let This "Gang" Wipe Out Your Milling Troubles . . .

Brown & Sharpe Cutters are your answer to the modern milling problems caused by greater speeds and faster feeds. They're expertly made from the finest steels to stand up longer under heavy loads. And, their designs have been "job-proved" on the largest production lines in the world. That's why more shops prefer them. Make your selection from the New Catalog 35C which describes the entire line, including a complete line of end mills. Write for your copy.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe

B·S

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R.I., U.S.A.

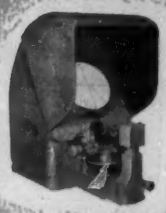
Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories • Machinists' Tools
Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

Printed in U.S.A.

11 MODELS

3 SCREEN SIZES

Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models

Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

JONES & LAMSON OPTICAL COMPARATORS

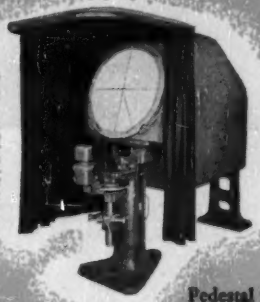
The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- They meet the requirements of toolroom, laboratory and production inspection.
- They precisely measure height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- They compare intricately contoured parts with a master outline—and measure the amount of error.
- They are convenient to operate, easy to set up and read direct—*without computation.*
- They operate under normal lighting conditions. *No darkroom is needed.*
- They will photograph the enlarged shadow and record its relationship to a master chart.
- Several persons may study the shadow *at the same time.*
- They will inspect and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.

Vertical Type
14" Diam. Screen

Direct
Projection
Type



Pedestal Type
30" Diam. Screen

A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY
502 Clinton St., Springfield, Vt., U.S.A.

Machine Tool Craftsmen Since 1835

COMPARATOR DIV.
Dept. 710

Jones & Lamson Machine Company
502 Clinton Street, Dept. 710
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

NAME_____ TITLE_____

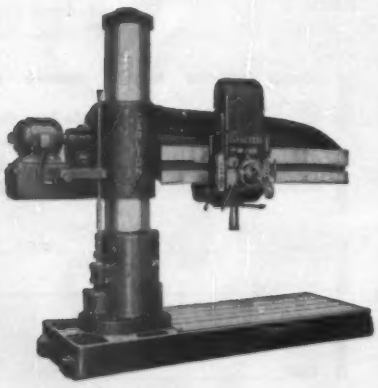
COMPANY_____

STREET_____

CITY_____ STATE_____

Only ONE can be called the Finest: Carlton

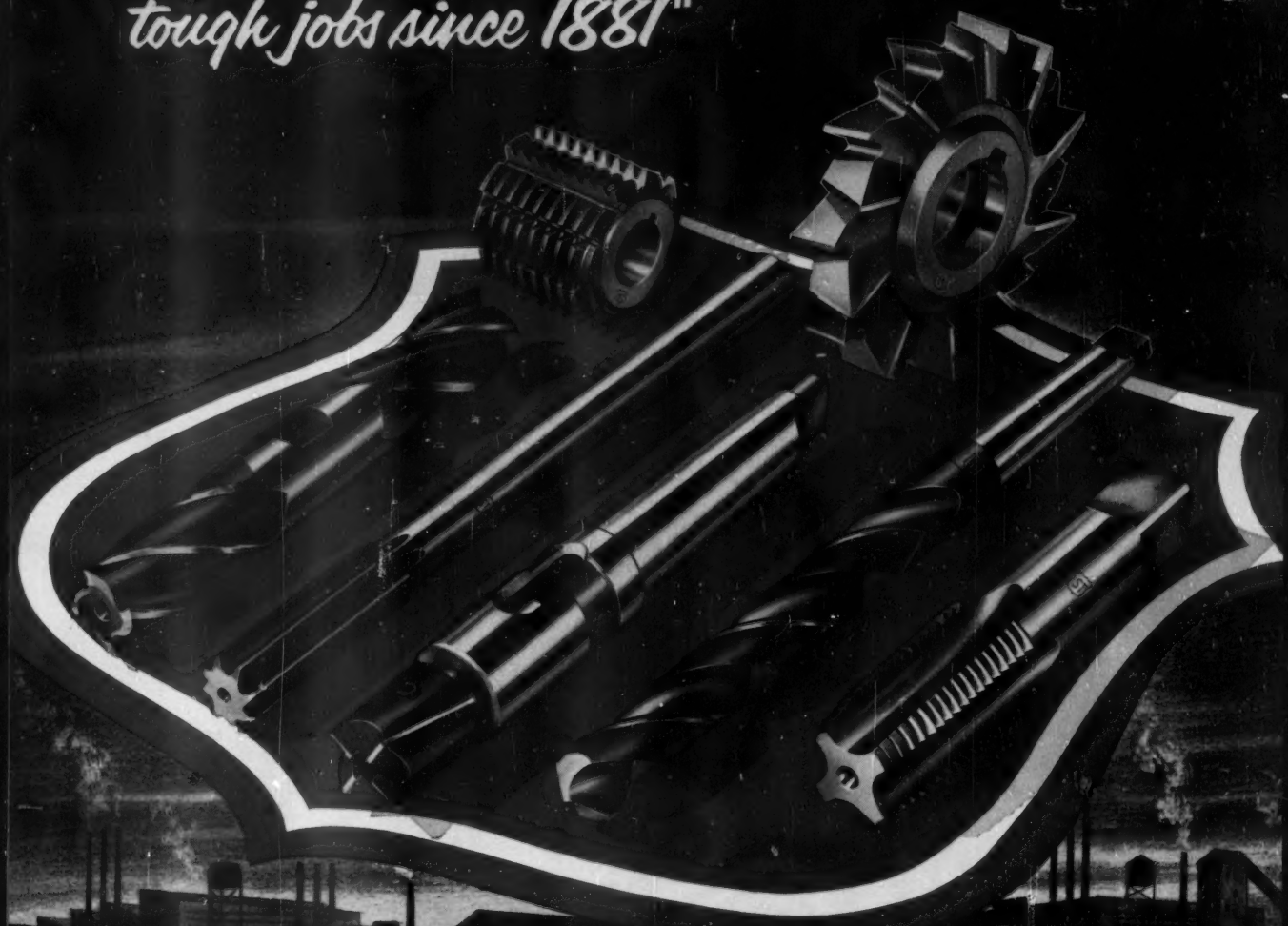
. . . here's another good reason why: low maintenance cost



CARLTON RADIAL DRILLS cost less to maintain because they are *designed for less maintenance attention.* For example: there's only *one* friction clutch to adjust. There are *no* tapered gibs to adjust because the head travels across the arm on hardened steel ways. Automatic lubrication throughout eliminates the damage and unnecessary wear that occurs in ordinary radial drills.

COMPARE CARLTON AND YOU'LL BUY CARLTON. Judge for yourself why Carlton radial drills are the first choice of American industry. Write for bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

"STANDARD for tough jobs since 1881"



Red Shield says:

Call your Industrial Supply Distributor for Shield Brand Twist Drills, Reamers, Taps, Dies, Milling Cutters, End Mills, Counterbores, Hobs, and Special Tools. Specialized factory service available everywhere.

STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*

It pays you to use

BALANCED *Action* TAPS

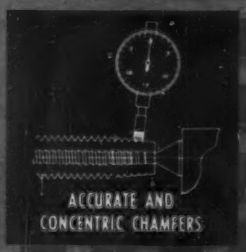
It takes care and skill to make taps that perform with BALANCED ACTION. Only Winter makes them.

It pays you to use BALANCED ACTION taps because of their accuracy—their longer life—and your saving in scrap losses.

EXACT FLUTE SPACING

UNIFORM FLUTE CONTOURS

PRECISION CHIP DRIVER CONTOURS



ACCURATE AND CONCENTRIC CHAMFERS

ALWAYS AT YOUR SERVICE

Your local Industrial Supply Distributor carries a complete stock of WINTER Balanced Action Taps.

WINTER

WINTER BROTHERS COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities.

Branches in New York • Detroit • Chicago • Dallas • San Francisco

Division of National Twist Drill & Tool Co.

Cutting Edges That
Cut Costs
Once you start using National Tools—whether for roughing or finishing, for production or for accuracy—you'll stay with them. Their fine cutting edges give you the better work that cuts your costs.
NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U.S.A.
Distributors in principal cities.
Factory branches: New York • Detroit
Chicago • Dallas • San Francisco
CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs and Special Tools.
NATIONAL
TWIST DRILL
& TOOL
ROCHESTER, MICH., U.S.A.
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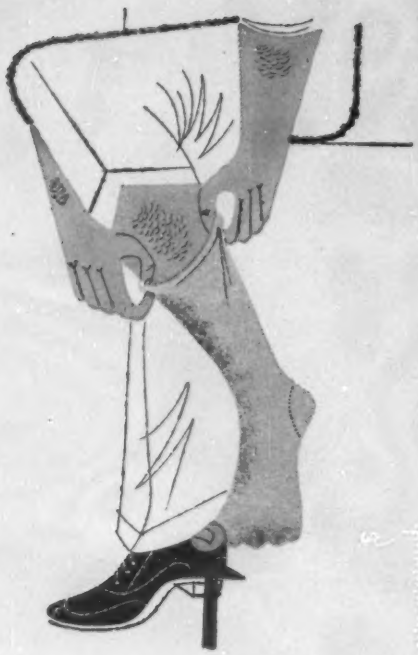
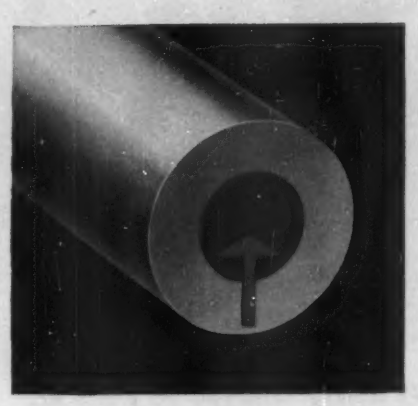


a hole here is a nuisance...



a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon—high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW TOOL STEEL**

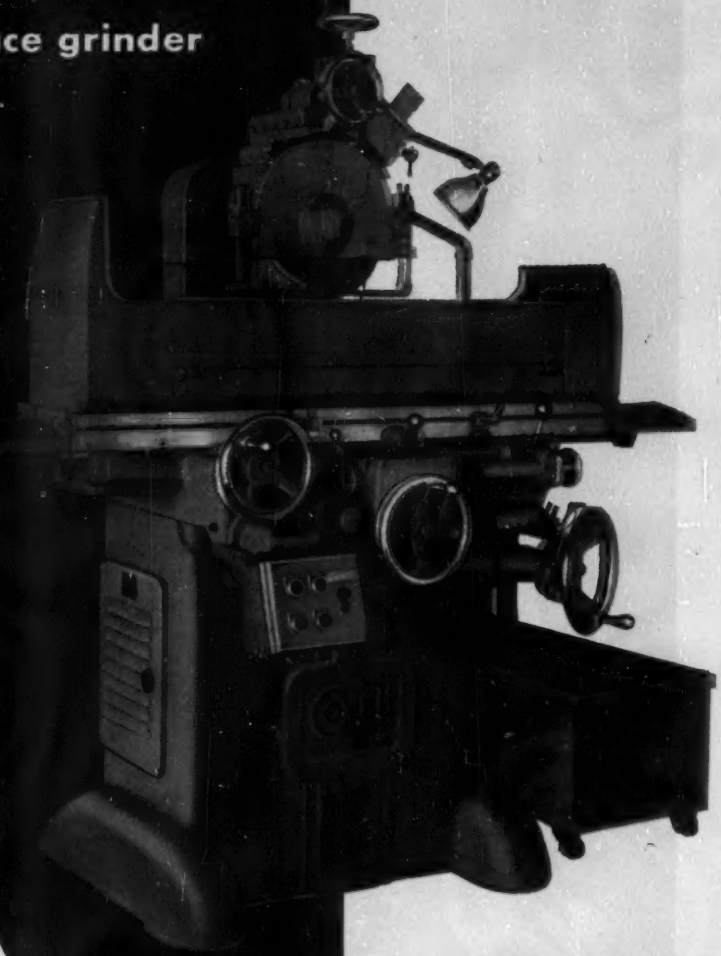
CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

WHAT COVEL'S 80 YEARS CAN MEAN TO *you*

when you select a surface grinder

It takes more than special features and fine materials to build the best surface grinders. Skilled workmanship, yes . . . modern methods and equipment, certainly. But there's a rare quality—a plus value that can make your grinder investment extra sound and that quality is yours with Covel . . . It's simply this: EIGHTY YEARS OF CUMULATIVE EXPERIENCE—of constant progress, keeping pace through four war production periods and through many business peaks and valleys.

So, when you select a Surface Grinder —or a Cutter and Tool Grinder, call on Covel and draw on this wealth of practical, productive experience. Send for data.



SURFACE GRINDERS
HYDRAULIC FEED:
14"x24"; 8"x24"; 6"x18"
HAND FEED: 6" x 18"

Send for Bulletin A-104

See Covel machines in operation
R. O. DEADERICK CO. SHOW
May 19, 20, 21
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UNIVERSAL
CUTTER and TOOL GRINDERS
10"x30"; 10"x24"; 8"x16"

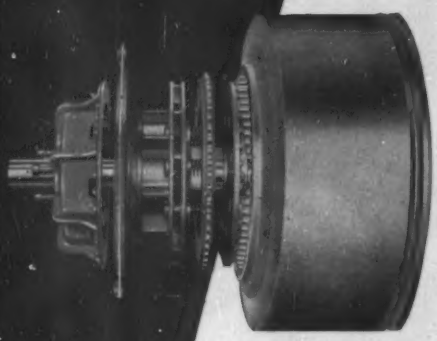
COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

Columbia
STEEL SQUARING SHEARS

up to 75% less gear wear with the exclusive air clutch!



Exploded View of Air Operated Disc Clutch

. . . another Columbia exclusive. It eliminates unnecessary gear wear

. . . gives never-failing overload protection

. . . cushions shock!

A cost-reducing, safety Air Clutch is one of the many exclusive, built-in Columbia "New Series" Shear features.

This air-operated clutch reduces gear wear as much as 75% since all gear movement is eliminated except in the actual cutting cycle. Inherent clutch slippage at the overload point protects machine and drive. Air-application of power is soft; shocks are not transmitted.

Other Columbia features you should know about include the exclusive Quick-Set Blade Clearance, Hydraulic Hold-downs, Jog Control for Ram Back Brace Adjustment, Air Counterbalances, Remote Foot Switch, and others. Together with basic ruggedness, rigidity and long-lasting accuracy these features mean that Columbia Shears offer more machine for the money!

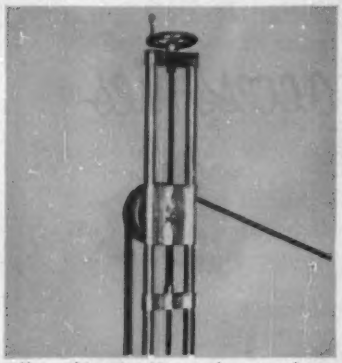
Columbia Steel Squaring Shear, Model 0610. Capacity 10' x 3/8".

Other exclusive Columbia features are explained in detail in FREE Bulletin No. PS-2. Write for it and the name of your Columbia dealer, *today!*

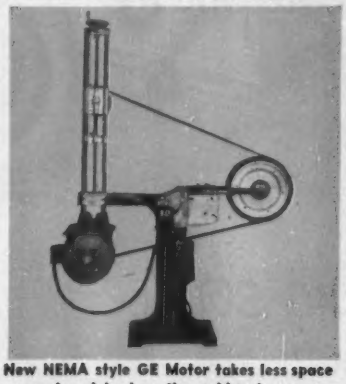
COLUMBIA DIVISION, THE LODGE & SHIPLEY CO.
HAMILTON 2, OHIO

new series **Columbia** STEEL SQUARING SHEARS and POWER PRESS BRAKES

With all equipment balanced on single base, operator can stand or sit.



No problem tracking, and new spring device maintains constant tension.



New NEMA style GE Motor takes less space and weighs less than older types.

Uses contact wheels 3" to 18" dia., and standard BEHR-MANNING BELTS.

Manufactured and sold by Stephen Bader & Co., 253 Langdon Blvd., Rockville Centre, L. I., N. Y.

SAVE SPACE and MONEY with NEW BELT POLISHER

New BADER "Space Saver," shown here, is the latest development in modern belt polishing machines. Contact wheel, idler, and motor are all mounted on a single pivotal base.

The BADER "Space Saver" occupies a minimum amount of valuable floor space. Installation is simple — lag the machine to the floor, make electrical connection, and start production.

New NEMA style motor takes 1/3 less space and weighs 1/3 less than conventional motors. And for your special interest, this BADER does a terrific polishing job with BEHR-MANNING® Belts.

See and try the new BADER "Space Saver" at your nearest BEHR-MANNING Demonstration Room. Contact our nearest Branch, or write Behr-Manning, Troy, N. Y., Dept. AM-5.

In Canada: Behr-Manning (Canada) Ltd., Brantford.

For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

BEHR-MANNING CORPORATION
division of NORTON Company

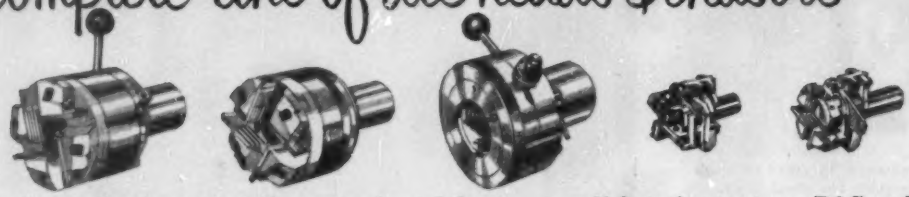
▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

G-5

For the newest in coated abrasives . . . watch BEHR-MANNING!

Jones & Lamson offers...

a complete line of die heads & chasers

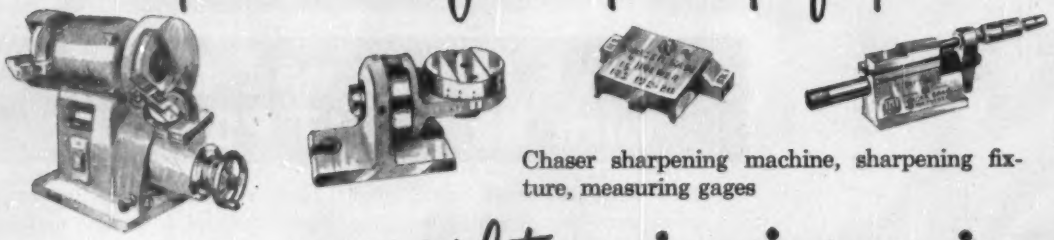


Automatic opening tangent stationary and revolving types, radial stationary type, B&S and small turret lathe types

a complete line of accessories

External and internal trip attachments, drill press adapter, floating holders

a complete line of sharpening equipment



Chaser sharpening machine, sharpening fixture, measuring gages

a complete engineering service

World's newest, most modern thread tool plant. Complete literature for all J&L thread tool products

J&L Automatic Opening Die Heads and Chasers assure: low initial cost — ease of operation — controlled resharpening — use of carbide where applicable. Class III threads guaranteed. This means important savings regardless of your tolerance requirements. Write to Dept. 710 for complete information.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

"AMERICANS" WORKING FOR NORDBERG

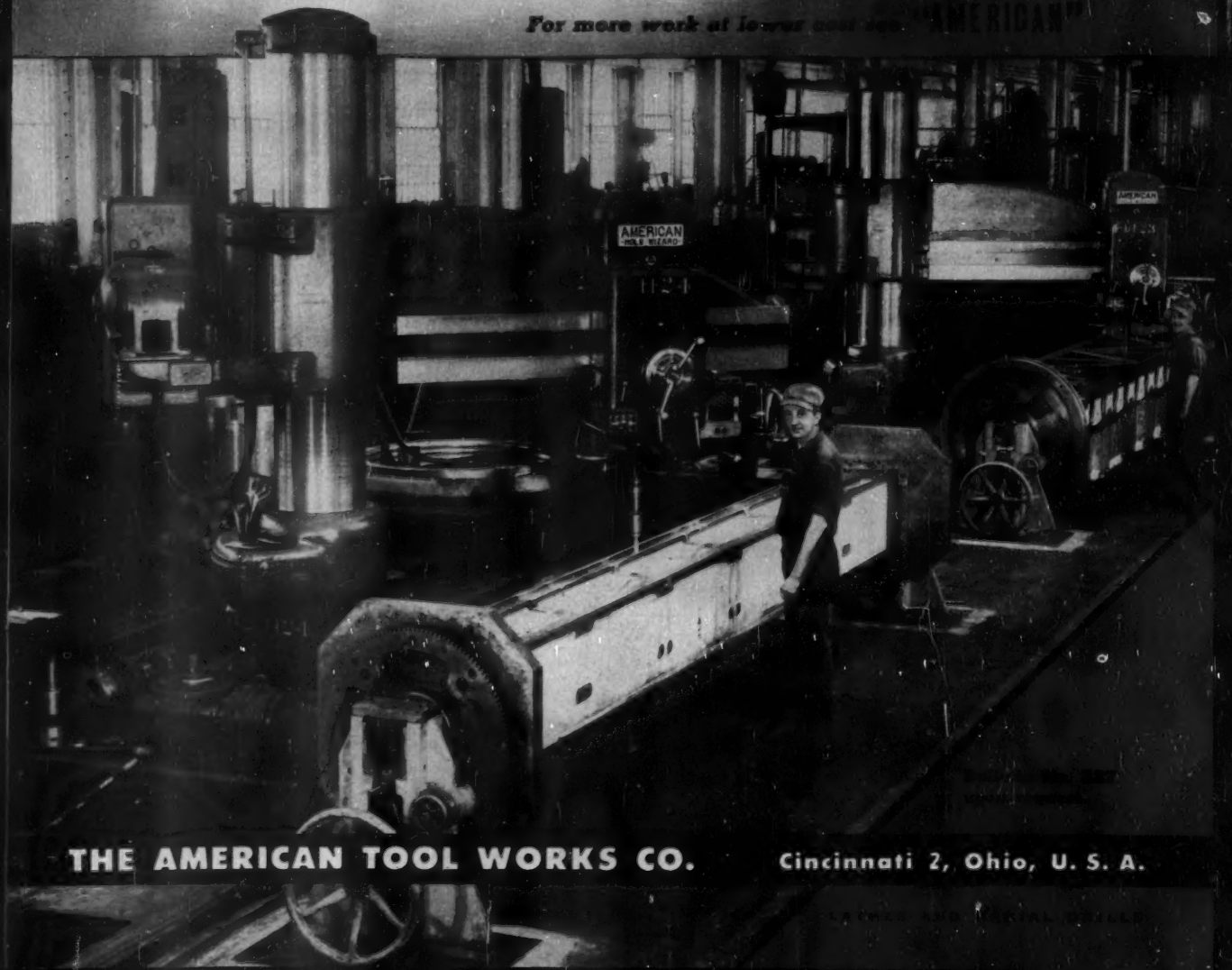
helping to profitably produce the quality products for which Nordberg Manufacturing Company of Milwaukee, Wisconsin is known the world over.

These "AMERICAN" Track Type Hole Wizard Radials mounted on mobile bases speed up drilling, tapping and boring operations in long, heavy work pieces by bringing the tool to the work rather than moving the work to the tool.

The work pieces are mounted in elaborate trunnion jig fixtures so different work planes may quickly be presented to the tool and a high degree of accuracy maintained.

The quality of Nordberg products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

For more work at lower cost use "AMERICAN"



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

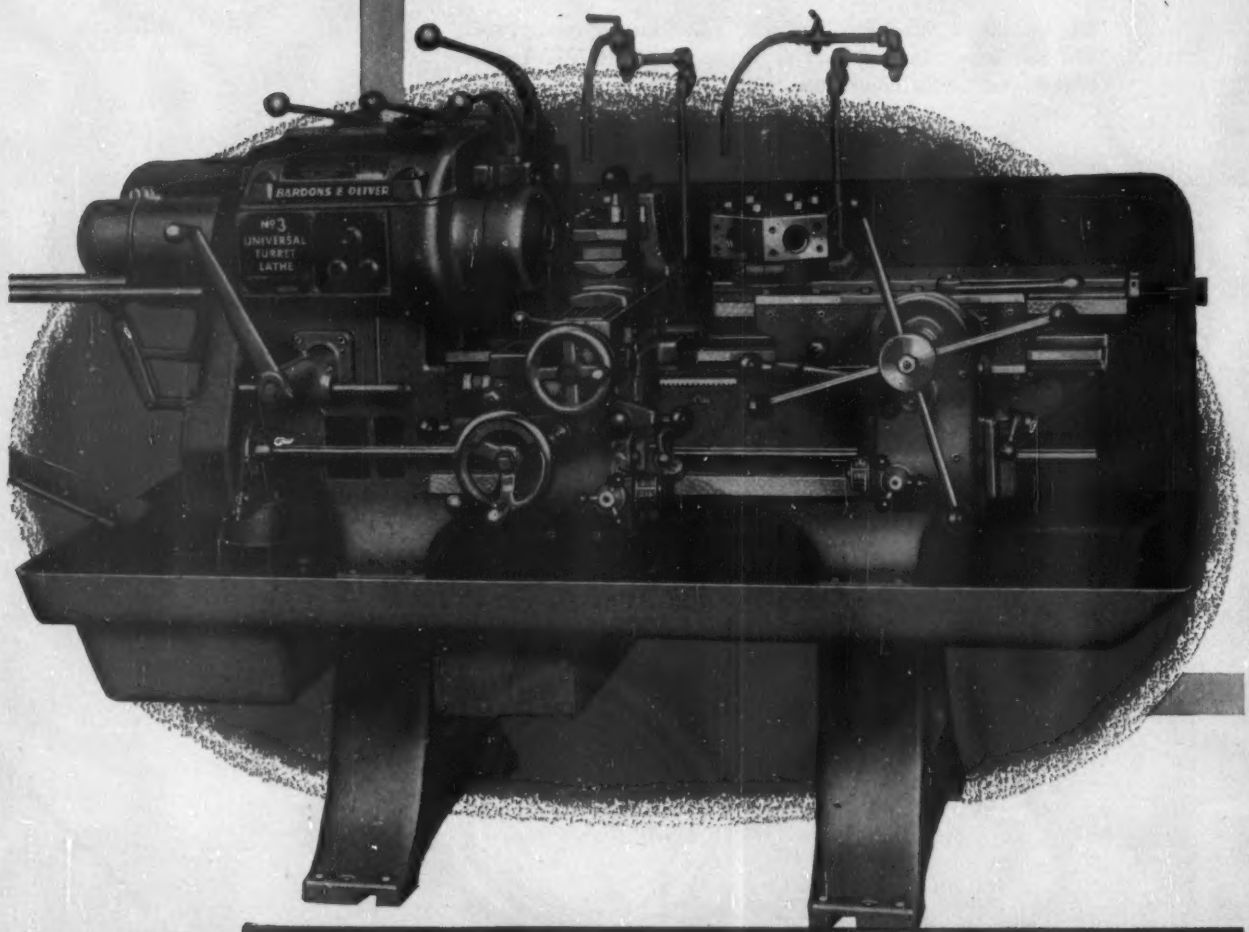
LATHES AND RADIAL DRILLS

New... BARDONS & OLIVER No. 3 TURRET LATHE...

★ 25% higher speed

★ 50% more power

★ 100% increased rigidity



BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

Featuring!

- √ 1825 R. P. M. Spindle Speed
- √ Unequaled Rigidity of "X" Type Cross Ribbing over Full Length of Bed
- √ 100% Anti-Friction Bearing Headstock
- √ Single Lever Feed Selectors for both the Hex Turret and Universal Carriage
- √ Alloy Bronze Anti-Backlash Nut on Cross Slide Screw
- √ "One-Shot" Lubrication of all Tool Slide Ways
- √ Flange Type Motor Mounting that Eliminates all Belts and Pulleys
- √ Hardened and Ground Steel Turret Slide and Saddle Ways, Gibs and Caps
- √ 7½ H. P. available at each one of 12 Geared Spindle Speeds
- √ Instantaneous High-Low Speed Change through Double Multi-Disc Clutch
- √ Replaceable Bed Ways of Solid Hardened and Ground Alloy Steel
- √ Large Hardened and Ground-in Thread Ball Bearing Cross Slide Screw
- √ Sealed Carriage and Saddle Aprons
- √ Improved Square Turret, Designed and Built for Lifetime Accuracy
- √ Impeller Type Coolant Pump with Individual Motor Drive
- √ Optional Collet Chuck Capacities (1½" or 2")

Specifications!

Swing Over Bed	15½ inches
Swing Over Guides	13¾ inches
Swing Over Cross Slide	7⅝ inches
Collet Chuck Capacity	1½ or 2 inch round
Hexagon Turret Travel	10 inches
Cross Slide Travel	9 inches
Carriage Longitudinal Travel	18½ inches
Turret and Carriage Power Feeds with Single Lever	6
Number of Speeds with Single Speed Motor	12
Motor Horse Power	7½
Net Weight With Cabinet Motor	3050 pounds
Net Weight With Flange Motor	2850 pounds

SEND FOR NEW NO. 3 CATALOG ▶

MANUFACTURERS OF A COMPLETE LINE OF TURRET LATHES AND CUTTING OFF LATHES

45,000 laminations

PER 8-HOUR SHIFT!

Westinghouse Electric Corporation

DANLY PRESS

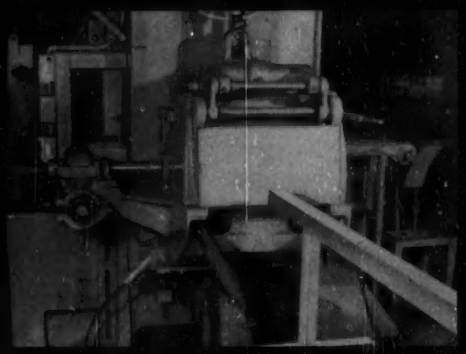
DANLY MACHINE SPECIALTIES, INC.

Send for this FREE Catalog

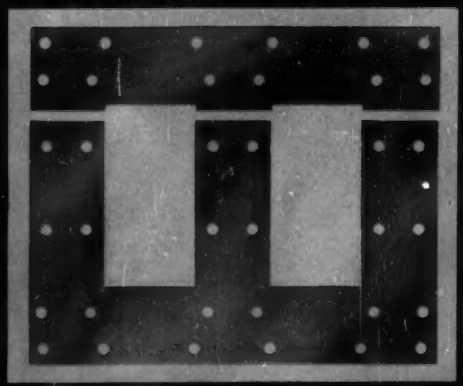
DANLY®

MECHANICAL PRESSES...50 to 3000 TONS
SINGLE, DOUBLE, TRIPLE, ACTION
AUTOFEED...UNDERDRIVE

Dynamic CBC (Counterbalancing Capacity) Engineered balancing of all moving parts under load, plus special design of press and counterbalance capacity to meet specific job needs, virtually eliminates "break-through" shock and "chucking" makes press operation smoother, increases life of both press and dies.



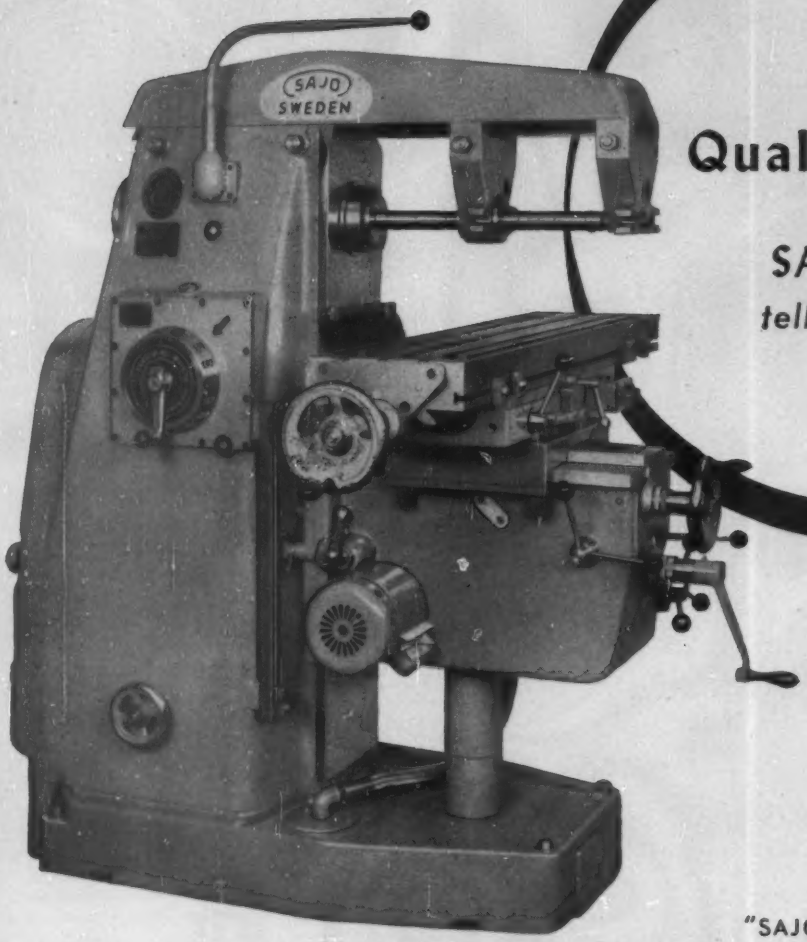
Faster Material Handling Feeding and scrap removal problems that go with high speed production are easily solved thanks to Danly's specially braced open bed construction. Slugs and scrap drop through the press bed and are continuously conveyed away as shown.



Longer Die Life Costly carbide progressive dies are used to pierce, notch and cut off these .010" thick silicon steel laminations. In the Danly Autofeed, the dies average 750,000 pieces before regrinding is necessary.

It costs less to run a DANLY PRESS!

If your manufacturing process involves high production and expensive dies, it will probably be worth your while to talk with a Danly Press Engineer. Call now—he will be glad to discuss your specific problems. There is no obligation for this service.



Quality pays off

SAJO *in operation tells its own story**

"SAJO" and "Quality" are synonymous. The high standards and painstaking Swedish craftsmanship on which the SAJO reputation has been established are faithfully maintained in all SAJO Milling Machines. They are built to assure the accuracy and dependability which mean profitable operation — and their cost is surprisingly low. Available in 3 models!

Model 54 (illustrated) a full No. 2 capacity ALL-GEARED Miller — Plain or Universal types — 7½ HP motor (5 HP optional) — 1½ HP table feed motor; #50 NMT spindle; 16 spindle speeds up to 1500 RPM; single lever speed and feed selectors with direct reading dials; single lever control for START-STOP-BRAKE; table power feed and POWER RAPID TRAVERSE in 3 directions. Model 53 Light Duty No. 2 ALL-GEARED Miller. Model 48 Light Duty No. 2 Utility Miller.

**Ask for references*

austin industrial corp.

76-F MAMARONECK AVE., WHITE PLAINS, N.Y.

Look for the Austin Seal — your full guarantee of satisfaction.

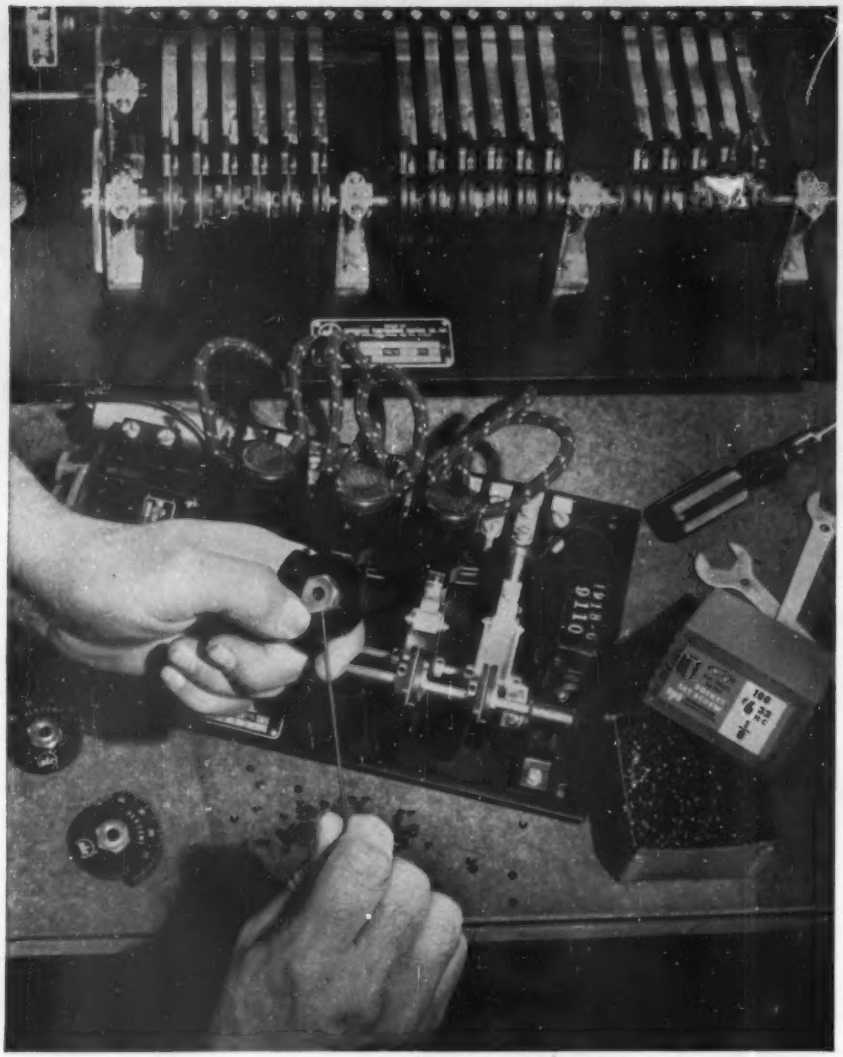
THE "GUN" TAP, the original spiral pointed tap, was developed by GREENFIELD to lick tap enemy No. 1, breakage due to chips clogging in the flutes. This problem is especially troublesome in "stringy" metals where the chip is long and curling.

The Gun point solves the problem in through holes by causing the chips to shear and "shoot" out ahead of the tap.

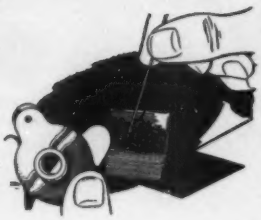
In some cases even blind holes can be tapped with the new Bottoming Gun Taps now furnished in machine screw and 1/4" to 1" sizes.

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS



Two UNBRAKO Self-Locking Socket Set Screws are used on each cam of these precision multicircuit cam timers. The screws position the cams so as to control accurately the sequence and duration of one or a series of individually timed machine or process operations.



Assembler picks up tiny UNBRAKO set screw with long arm key preparatory to threading it into cam assembly.

He inserts the UNBRAKO, and turns it into the assembly; then after positioning cam, tightens it. The accurate depth and size of the hex socket result in maximum torquing—the knurled cup point holds the cam accurately in place.

UNBRAKOs—made of heat treated alloy steel—have fully formed threads, Class 3 fit; are supplied in standard sizes from # 4 to 1".

You'll need less space for storage when you use UNBRAKO Standards—stocked by your distributor

You'll need less space for storage and be able to carry a smaller inventory, because standard UNBRAKO socket screw products are in stock at your local industrial distributor's. And you'll save time and money, because deliveries are prompt. For more information, write for UNBRAKO Standards—a complete listing of socket screw products made by the world's largest manufacturer of these precision fasteners. STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

UNBRAKO SOCKET SCREW DIVISION

SPS

JENKINTOWN PENNSYLVANIA

"Dependable performance...matchless service —that's why our pressroom is 96% BLISS"

says Ben Suckle, President of Suckle Electronics Co., one of the largest custom sheet metal fabricators for the electronics industry.

The tail wags the dog in this modern-day Horatio Alger story:

Back in 1946, Suckle Electronics Company, a consulting firm specializing in radio and television engineering, decided to broaden the base of its business by entering the contract stamping business in a limited way.

The sky, though, turned out to be the limit. For today, a scant seven years later, Suckle Electronics Company is one of the largest custom sheet metal fabricators supplying the electronics industry.

"In our first year," says Ben Suckle, "a lack of capital forced us to build up our pressroom with second hand equipment. We realized, however, that to meet the quick delivery demands of the electronics industry a dependable pressroom is a must. In 1948, we ordered our first new press—a Bliss. We quickly added more, and now there are 40. We standardized on Bliss because our experience proved that the Bliss presses can take our 96-hour-a-week operation, since Bliss replacement parts are truly interchangeable without machining or hand-fitting, and because engineering and other services offered by Bliss are eminently satisfactory."

If, like Suckle Electronics, you're looking for dependability in your pressroom, call a Bliss engineer. He will be glad to help you pick the proper press for your operation.

BLISS
SINCE 1857

on your press is more than a name...it's a *guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Subsidiary: The Die Supply Company, Cleveland, O. • E. W. Bliss (England) Ltd., Derby • E. W. Bliss Company (Paris) France

U. S. Plants in Canton, Salem and Toledo, Ohio; Hastings, Michigan; and San Jose, Calif. *Branch Offices* in Chicago, Cleveland, Dryton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. *West Coast Representatives:* Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. *Other representatives throughout the world.*

ARMSTRONG

Use the Correct...

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the newer additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the newer "spring" form threading tools and cutting-off, etc., etc.

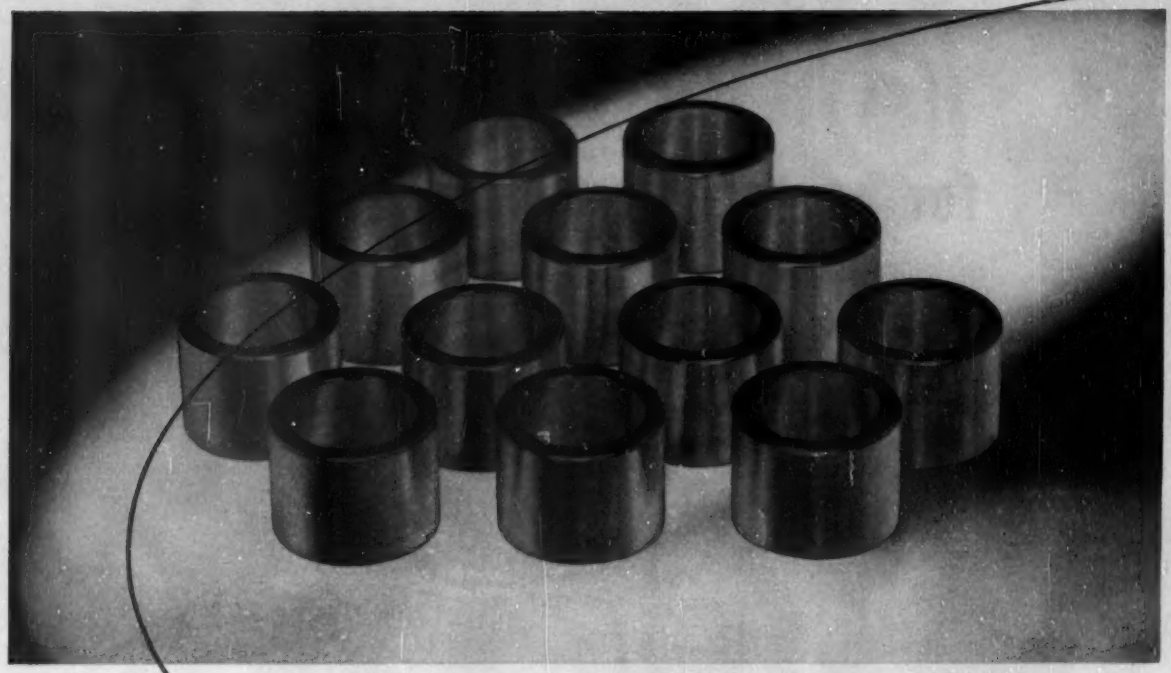
Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. ARMSTRONG AVE. **CHICAGO 30, ILL.**

No. 9 in a Series



these requirements in mind...

So varied are the demands on multiple spindle automatics it is impossible to design into one model — or a number of models — all the facilities that will satisfy every requirement. To excel in any range of work the design of a machine of this type must be directed toward that work.

Cone's new General Datalog lists over forty CONOMATIC models that are designed with these requirements in mind. For any range of work, Conomatics are built to more efficiently serve the latest cutting tool materials.

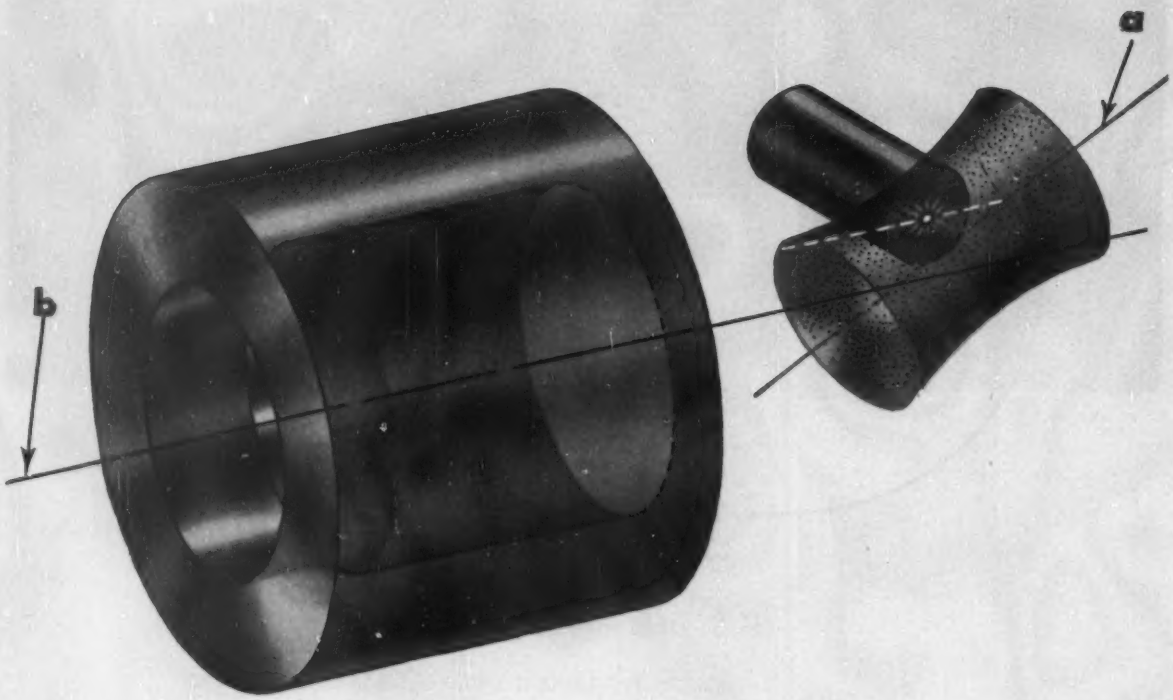
data for comparison

Part	Bushing
Machine	1⅛" Six Conomatic
Tools	100% Carbide Tipped
Material	Stainless Steel Tubing
Stock Size	1¼" OD; ¾" ID
R. P. M.	Work Spindle — 1033 Opposed Spindle—1048
Time	7 Seconds per Cycle 3.5 Seconds per Piece

Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

alignment

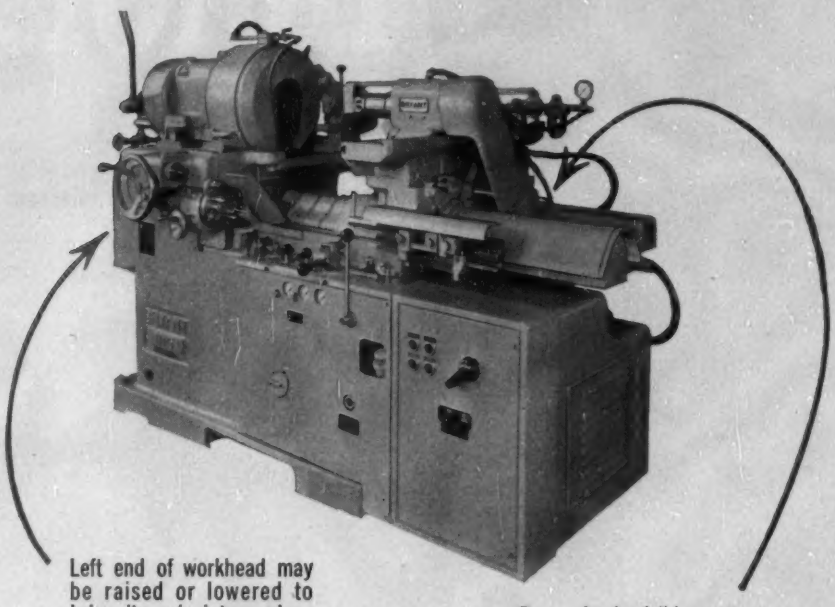
for better internal grinding



IT is generally believed in internal grinding that once the grinding wheel passes the diamond, the form of the wheel will be a perfect cylinder. In our illustration the wheel is tipped as it passes the diamond and an hourglass form is generated on the wheel. This condition is not peculiar to an internal grinder. The same form is generated in turning an O.D. on a lathe if the tailstock is either high or low.

The path of the diamond is a straight line across the surface of the wheel, but the wheel will not contact the work on the same straight line. Contact may be at a point on each end of the wheel. Since the wheel does not contact across its full face, wheel wear will be excessive and the wheel will act soft.

The geometry of the hole may be upset as in the illustration, with the result that the back of the hole will be tight. Neither turning the workhead nor changing the length of traverse will correct this error. Because the wheel is contacting at either one or two points, instead of a straight line, the surface finish will be poor. The remedy is to correct the alignment by bringing the wheel center line "a" parallel with the path of the wheel and in plane with the work center line "b".



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with the wheel path.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This machine is for general purpose hole grinding. It has convenient centralized controls and all features necessary to handle a variety of work with minimum time and effort needed for changing jobs. For stable 3-point support, the wheel spindle is mounted on a cylindrical bar which is supported on 2 cylindrical bearings. The rear of the slide is supported on a hardened and ground guide plate. Workhead may be swiveled for grinding tapers up to 90° included angle. Provision is made for mounting a face grinding spindle in addition to the hole grinding spindle. The No. 1116 will swing 16″ with 12″ max. hole depth. Write for folder.

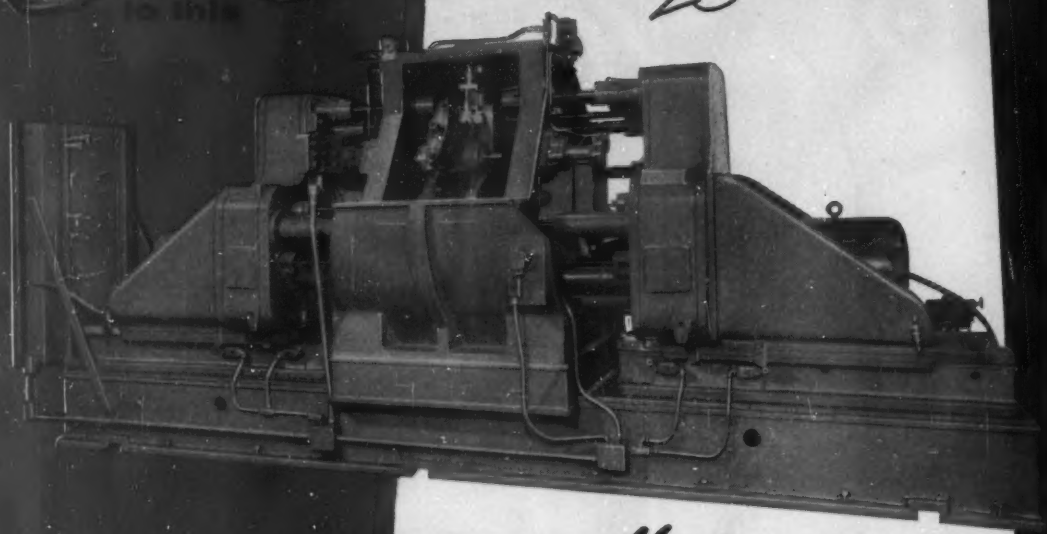
Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

...in just 23 seconds!



OPERATIONAL CYCLE:

STATION	
1	Double Load and Unload
2	Drill four 1" holes
3	Re-drill holes to 1 7/16"
4	Rough face four holes
5	Finish face four holes
6	Chamfer four holes

with this *Morris* mor-speed production machine

The Morris Two Way Horizontal High Production Machine finishes universal joint flange yokes at the rate of 153 per minute at 100% efficiency.

It, like other Morris MOR-SPEED Machines, is made up of standard MOR-SPEED units plus certain special parts. Because of Morris methods and standard designs, the user gets a special purpose machine . . . capable of high speed, precision production . . . without the usual sky-high cost and limited application of a "special machine."

Morris MOR-SPEED Machines save space, time and costs for leading manufacturers in every industry.

If you have multiple drilling, tapping, boring or similar operations on a mass production basis, Morris Engineers may may be able to show you substantial savings on a modest investment.

Morris

THE MORRIS MACHINE TOOL CO.
933 HARRIET STREET
CINCINNATI 3, OHIO

National Tool Co.

Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

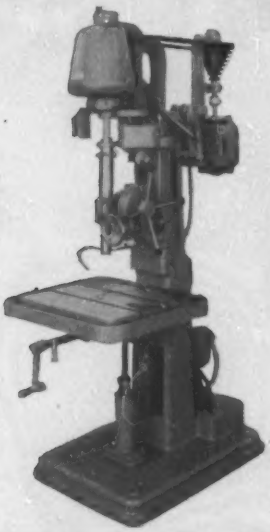
National Tools Cleveland

National

TOOL CO.

Cleveland 2, Ohio

There is a quality



21" sliding head drills are available in box and round column models. Multiple-spindle arrangements up to 6 spindles are available. Three distinct methods of feed are incorporated as standard equipment. Three optional ranges of power feed are provided. Eight spindle speeds—76 r. p. m. to 2025 r. p. m.

16"-3000 sliding head drills are available in both floor and bench models, and with multiple-spindle arrangements up to 6 spindles. Six spindle speeds are provided.

21" Box Column Floor
$1624.00*

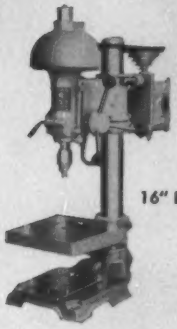
16"-3000 Floor
$631.00*

for every job and every budget

For drilling operations 1½" OD and under, Cincinnati Drills combine dependability with economy. Regardless of your drilling jobs—production, maintenance or general machine work—there is a Cincinnati Drill to fit your needs. And they are the only quality line of drills at these low, low prices.

For complete information and prices, write on company letterhead for the name of your nearby Cincinnati dealer. Cincinnati Lathe & Tool Co., 3245 Disney, Cincinnati 9, Ohio.

Cincinnati Drill



16" Royal Bench
$93.00*

18" Royal Bench
$246.00*

16" Royal Floor
$103.00*

The Royal line of Cincinnati Drills includes both 16" and 18" sizes in floor, bench and multiple-spindle arrangements. They meet the demand for general purpose, sensitive drills capable of production work at a minimum investment.

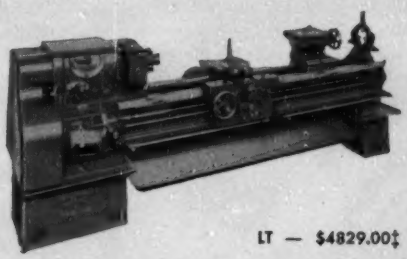
*Less motor and controls.
†10" x 24" std. drive. Includes motor and controls.
‡16" x 30". Includes motor and controls.
All machines F. O. B. factory.
All prices subject to change without notice.

center on . . .

cincinnati lathes and drills

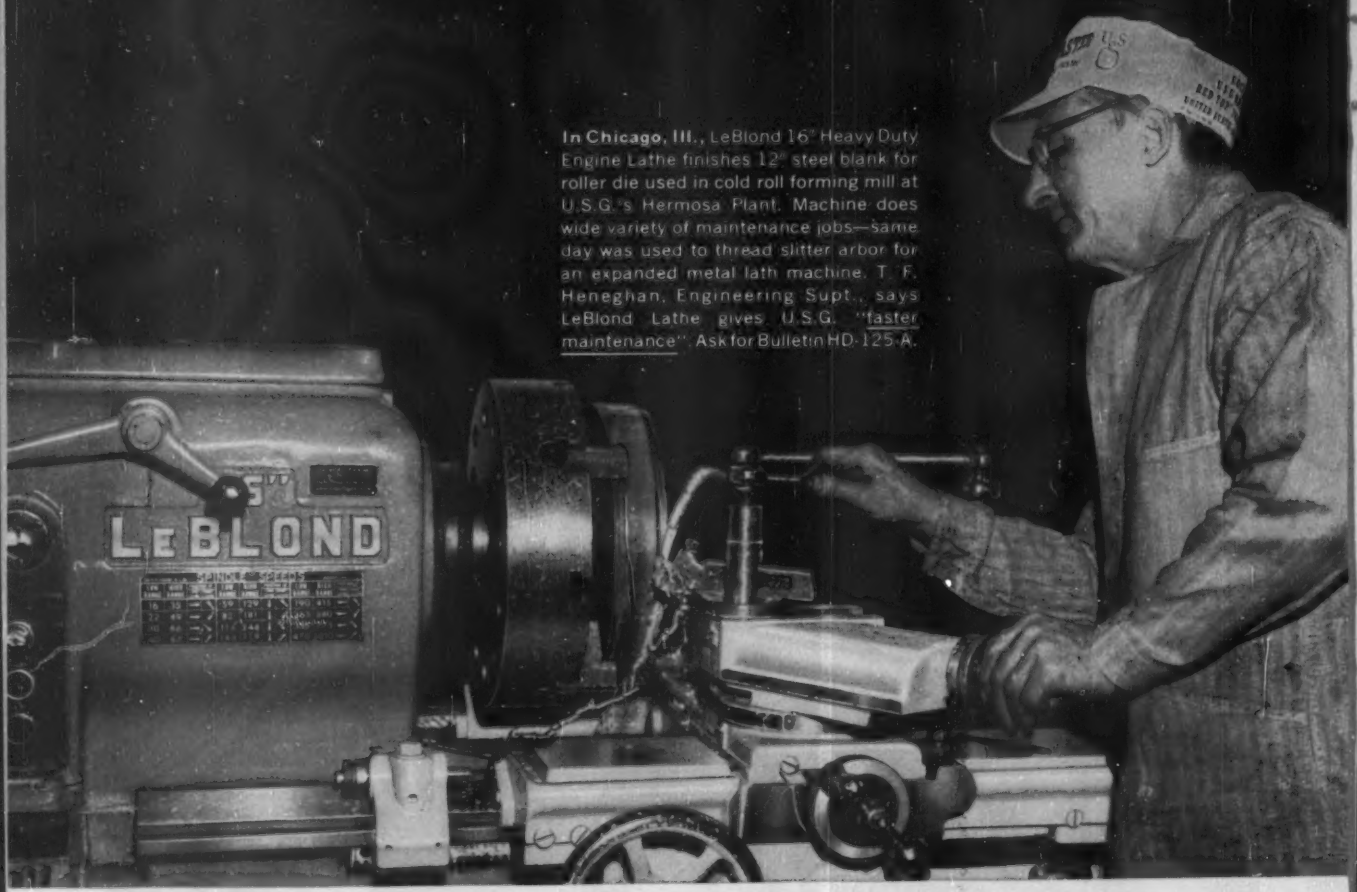
THERE IS A COMPLETE LINE OF CINCINNATI TRAY-TOP AND LT LATHES

Tray-Top — $1793.00†

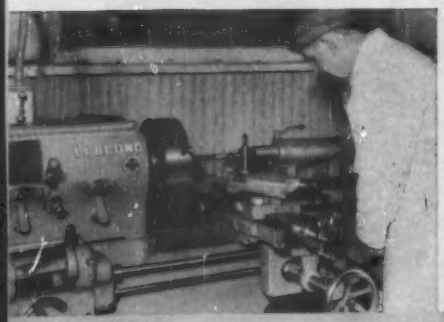


LT — $4829.00‡

Versatile LeBlond Lathes Knock Down

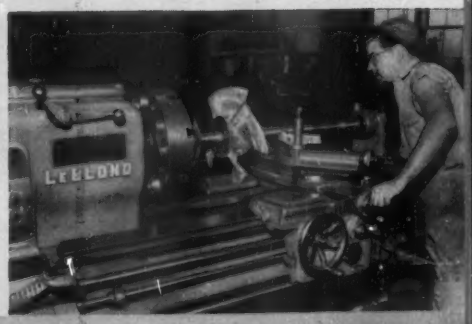


In Chicago, Ill., LeBlond 16" Heavy Duty Engine Lathe finishes 12" steel blank for roller die used in cold roll forming mill at U.S.G.'s Hermosa Plant. Machine does wide variety of maintenance jobs—same day was used to thread slitter arbor for an expanded metal lath machine. T. F. Heneghan, Engineering Supt., says LeBlond Lathe gives U.S.G. "faster maintenance". Ask for Bulletin HD-125-A.



In Norfolk, Va. versatile LeBlond 19" Regal Gap Lathe recuts welded boot scraper shaft. Exacting precision is number one requirement here. Note removable bed section is in place on this job, can be removed to accommodate work up to 27¼" diameter. Ask for Bulletin R-PG-1-A.

In Ft. Dodge, Iowa, LeBlond 17" Regal Lathe bores sprocket to ±.001". Sprocket must fit bearing shaft also turned on the LeBlond. Plant Engineer, John F. Hoertz, says, "This lathe holds tolerances better than previous lathes, saves tool life, speeds up maintenance work . . . ". Ask for Bulletin R-135-A.



In Greenville, Miss., LeBlond 16" Heavy Duty Engine Lathe dresses down shaft for flume return pump, part of the water return system at U.S.G.'s Pressed Board Plant. Other jobs include machining precision bearings for Pelton pump, turning down built-up bushing on universal joint for a steam press—typical of the great variety of turning work now done in U.S.G.'s own shops. Many used to be jobbed out—cost extra time and money. Ask for Bulletin HD-125-A.

"Upkeep" Costs for U.S. Gypsum

16 U.S.G. Plants from Maine to California

depend on LeBlonds for speedy, economical maintenance.

Dozens of turning jobs that used to be "farmed out" by U.S. Gypsum Plants now get done at less cost and *days sooner*, right in U.S.G.'s own maintenance shops—thanks to versatile LeBlond Lathes.

With U.S.G.'s quarry-to-finished-product operation, plant machinery ranges from huge mining equipment—to processing machinery—to speedy conveyors—to intricate packaging machines that bundle up finished products. Who knows what the LeBlond's next "fix-it" turning job will be? Today it's dressing down the shaft of a flume return pump. Tomorrow it's finishing a precision bearing where the critical tolerance goes down to tenths!

Convenience, low cost, dependability, wide variety of work—that's what LeBlond Lathes mean to maintenance men at U.S. Gypsum. And that's why there's at least one LeBlond Lathe on maintenance work in each of 16 U.S.G. Plants—from Maine to California.

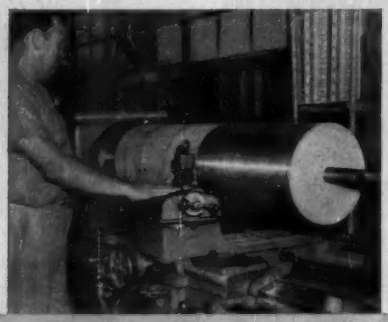
How many of *your* turning jobs did you send out of your plant this month? Is the "other fellow's" profit a large chunk of your maintenance cost?

Call your nearby LeBlond Distributor. Show him the variety of turning work that your maintenance requires. Tell him how long it takes to get it done elsewhere, what it costs. From LeBlond's complete line of 76 different lathe models, he can recommend lathes that will handle all of it—or at least a major portion. You'll get the work done sooner, dependably, and without an outsider's profit to pay for.

For complete information contact your LeBlond distributor or write—

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

In Alabaster, Mich., LeBlond 24" Regal Lathe threads take-up bolt for 4½ yard Bucyrus-Erie Rock Shovel. Four threads per inch, speed 95 rpm. Plant Engineer, E. John Minderman, says this LeBlond Lathe handles work ranging "from very small parts found in electrical and hydraulic equipment to large gears, shafts and armatures that require the full capacity of the machine". Reports "very dependable service". Ask for Bulletin R-163-A.



In Plaster City, Calif., U.S.G. saves at least seven days by machining this roller on the LeBlond 20" Standard Duty Engine Lathe—right in their own shop. Job used to be sent out, took up to ten days to complete. Another LeBlond Lathe is still in regular use at the Plaster City Plant, after over 25 years of maintenance work. Plant Engineer, R. W. Langewisch, says LeBlond Lathes "save time, expense, increase shop capacity". Ask for Bulletin SD-250-A.

LeBLOND of Cincinnati

World's largest builder of a Complete Line of Lathes—for More than 66 Years.

HOW TO SAVE HOURS

of Production Time

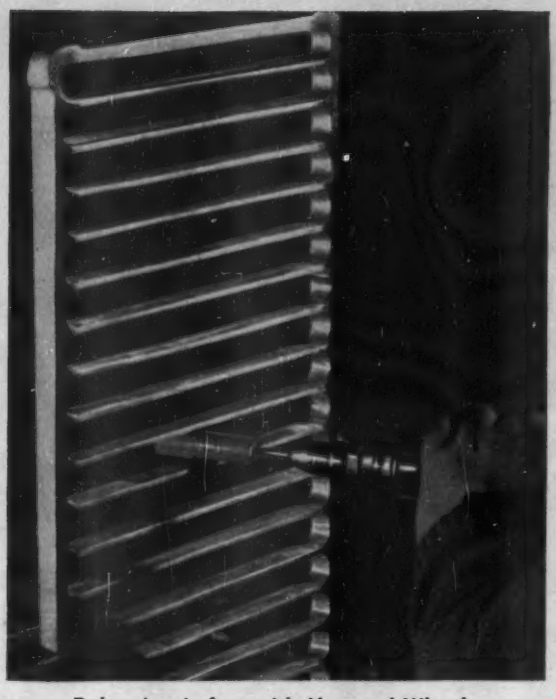
***...with Mounted Wheels and Points by* CARBORUNDUM**

Seconds saved in one operation on your production line soon add up to hours ...and it will pay you to study your grinding and finishing jobs to see how many can be speeded by using Mounted Wheels and Points by CARBORUNDUM. They are famous for "chopping" seconds—for eliminating slow, tedious hand finishing operations and for speeding every internal grinding job.

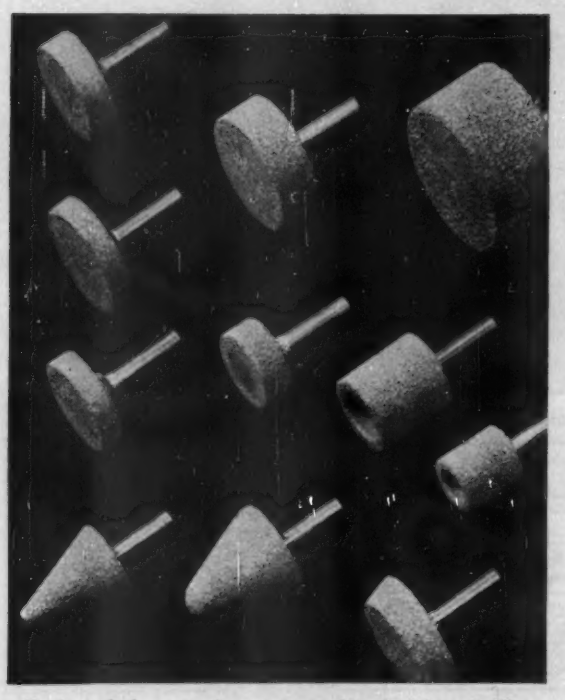
Rough or finish any surface—curved or flat.

Fast, economical for internal grinding.

...continually putting more sense in your abra ive dolla



Deburring is fast with Mounted Wheels.



Choice of shapes, sizes to speed portable grinding.

WITH HIGH SPEED PORTABLE EQUIPMENT and CARBORUNDUM's Mounted Wheels you can rough or finish grind, deburr, chamfer, break corners . . . perform dozens of tasks fast, safely. The wide choice of shapes and sizes permits grinding and finishing on any surface—flats, contours, hard-to-reach areas, inside diameters of all types.

FOR INTERNAL GRINDING, TOO—whether you use a single purpose machine, a tool and cutter grinder or a tool post grinder—you'll find Mounted Wheels and Points by CARBORUNDUM tops in speed, efficiency and economy.

USE ALUMINUM OXIDE MOUNTED WHEELS on materials of high tensile strength—plain and alloy steel, high speed steel, annealed malleable iron, hard bronze. Use silicon carbide mounted wheels on materials such as cast iron, brass, bronze, aluminum and many non-metallics.

● **YOUR CARBORUNDUM DISTRIBUTOR OR SALESMAN** will gladly show you how these cost-cutters can best serve you. He's listed in the yellow pages under "Abrasives" or "Grinding Wheels." Or send the coupon for your FREE copy of "Mounted Wheels and related Abrasive Products"—a 32-page booklet which gives you complete information on mounted wheel sizes, shapes, grains, bonds and mandrels for portable and internal grinding. There's a section on popular MX® Mounted Wheels . . . which finish as they cut; and a section on Coated Abrasive Products for portable grinding. Grading recommendations are included for many operations.

SEND TODAY!

THE CARBORUNDUM COMPANY, Dept. AM 81-48
Niagara Falls, New York

Please send your booklet, "Mounted Wheels and related Abrasive Products" to:

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COMPANY _____

STREET AND NUMBER _____

CITY _____ ZONE _____ STATE _____

CARBORUNDUM

REGISTERED TRADE MARK

81-48

WHEN YOU BUY SHEAVES...

Get All These Features!

ALL SHEAVES ARE NOT ALIKE. ONLY *Magic-Grip* SHEAVES COMBINE ALL THESE IMPORTANT FEATURES:

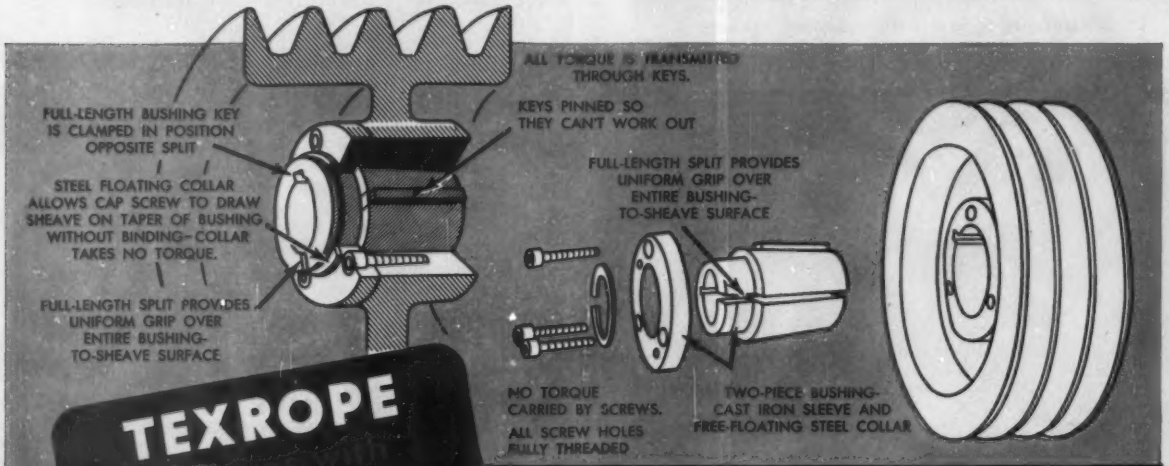
1 Full-length contact between bushing and shaft. Bushing is slit full length instead of part way. Result — when tapered bushing is slid into tapered sheave bore, pressure is applied equally all around bushing along full length. Sheave can't get out of alignment or develop excessive runout.

2 Full-key drive — Torque between bushing and shaft, and between bushing and sheave is transmitted by keys instead of threaded screws. Jamming of screws from shock overloads eliminated.

3 One-piece mounting — *Magic-Grip* sheave installs as a unit instead of in two pieces. Simply slip sheave on shaft and tighten cap screws. Complete sheave can be moved back and forth on shaft to adjust position.

4 Full-threaded screws — Cap screws in *Magic-Grip* sheaves engage a full thread — instead of a partial thread. Stripping and jamming problems eliminated!

Texrope and Magic-Grip are Allis-Chalmers trademarks.


FULL-LENGTH BUSHING KEY IS CLAMPED IN POSITION OPPOSITE SPLIT
STEEL FLOATING COLLAR ALLOWS CAP SCREW TO DRAW SHEAVE ON TAPER OF BUSHING WITHOUT BINDING—COLLAR TAKES NO TORQUE.
FULL-LENGTH SPLIT PROVIDES UNIFORM GRIP OVER ENTIRE BUSHING-TO-SHEAVE SURFACE
ALL TORQUE IS TRANSMITTED THROUGH KEYS.
KEYS PINNED SO THEY CAN'T WORK OUT
FULL-LENGTH SPLIT PROVIDES UNIFORM GRIP OVER ENTIRE BUSHING-TO-SHEAVE SURFACE
NO TORQUE CARRIED BY SCREWS.
ALL SCREW HOLES FULLY THREADED
TWO-PIECE BUSHING—CAST IRON SLEEVE AND FREE-FLOATING STEEL COLLAR
TEXROPE
Magic-Grip

All Allis-Chalmers sheaves available with *Magic-Grip* bushing.

Get more information on the fastest mounting sheave on the market. Call your nearby A-C distributor or district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4278

Here's Comparison of *Magic-Grip* Sheave and Other Sheaves

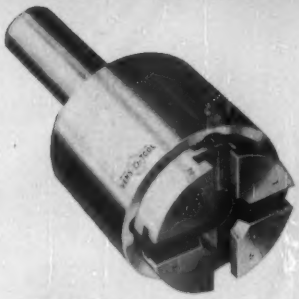
	Magic-Grip Sheaves	SHEAVE A	SHEAVE B	SHEAVE C
Bushing fully split for uniform clamping action.	Yes	Yes	No	Yes
Load carried by keys instead of threaded bolts.	Yes	No	No	No
Bushings cover full range of NEMA "probable" shaft diameters.	Yes	Yes	Yes	No
All screws engage full thread.	Yes	Yes	Yes	No
Mounts in one piece.	Yes	No	Yes	Yes
Squares itself with shaft.	Yes	No	No	No

ALLIS-CHALMERS

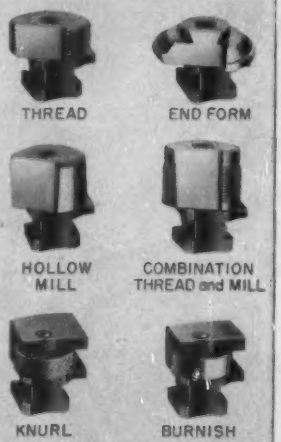
A-C ALLIS-CHALMERS

knurled....

78% faster



WITH CIRCULAR CUTTERS



WITH BLADE CUTTERS

WITH VERS-O-TOOL

When Whitin Machine Works, Whitinsville, Mass., applied their 1⅝" standard Vers-o-tool to one-pass knurling this textile machine part (7" long, B-1113 steel), they stepped up former production from 72 to 128 pieces per hour.

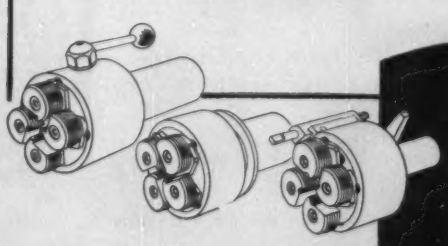
They get a higher quality too, because the 4-cutter Vers-o-tool head opens instantly at the end of the cut and pulls back fast without contact to damage the sharp knurl. Thousands of different jobs are run every day with standard Vers-o-tools equipped with multiple chasers or cutters such as those shown at the left.

Most of these simple, rugged heads are used for threading, equipped with the long lived Ground Thread Circular Chasers—most economical for long runs—or with the lower-cost Adjustable Blade Ground Thread Chasers for smaller lots. All guarantee Class 3 or pressure-tight quality threads—and smoother.

Conversion from Circular Chaser threading to any other type multiple cutters is simple: you change only the cutters and blocks—all types of which are interchangeable, head size for head size, for revolving or non-revolving heads. Vers-o-tool capacities range from .056" to 6½".

Ask us to show you how standard VERS-O-TOOLS can step up your OUTPUT, guarantee ACCURACY, reduce your TOOL INVESTMENT and your OPERATING COST. Ask for catalog DT-52.

24-hour deliveries on standard stockable NC and NF chasers and blocks. Also National Taper Pipe and Dry Seal.



The NATIONAL ACME COMPANY

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ACME-GRIDLEY BAR and CHUCKING AUTOMATICS

1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.

Through specialization, Card is better prepared to fulfill your most exacting threading requirements.

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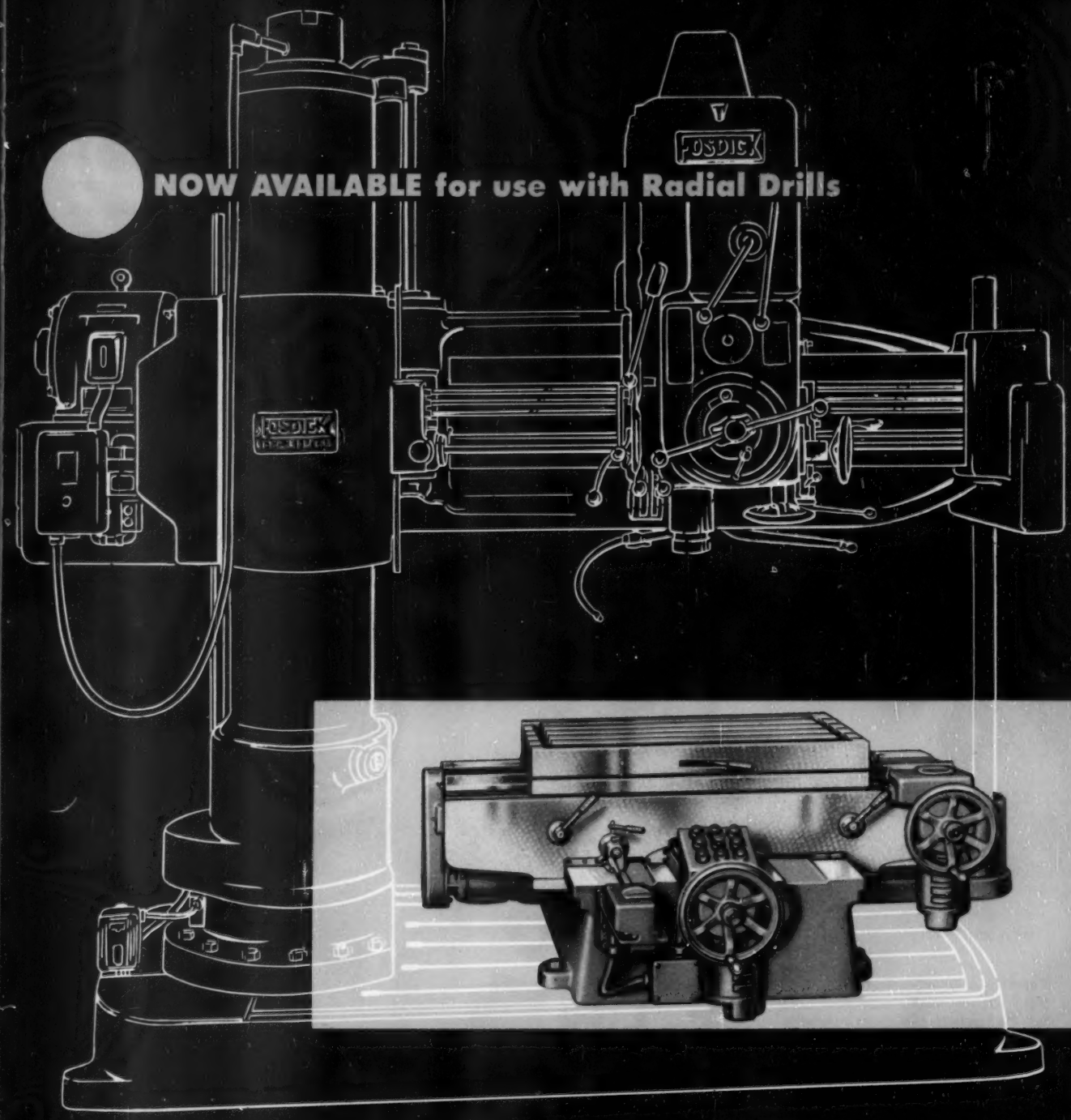
Completely stocked offices at Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle
See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. **TAPS • DIES • SCREW PLATES**

NOW AVAILABLE for use with Radial Drills



FOSDICK AUTOMATIC POSITIONER

- Eliminates costly jigs, stop adjustments—yet has advantages of both.
- Gives exact reproduction of drilled, bored, tapped and reamed parts.
- Automatically positions work to ± .0001".
- Gives rapid PRECISION production without experienced operators.

FOSDICK AUTOMATIC POSITIONER

The Fosdick Automatic Positioner gives you exact reproduction of precision drilled, bored, tapped and reamed parts – without jigs, without setting stop adjustments. Once two simple duplicating bars are prepared, positioning of work is done automatically at the touch of a button, accurate to ± .0001"!

The two easily-made, easily-stored duplicating bars are your *permanent* record of positions for a particular job. Once a job is run, you store the bars, use them every time you rerun that same job – weeks, months or years later.

Two easily-made, easily-stored duplicating bars control positioning

One bar locates holes lengthwise, the other locates them crosswise. Made of ⅜" bar stock, each duplicating bar is bored to correspond precisely with the position of each hole in the work.

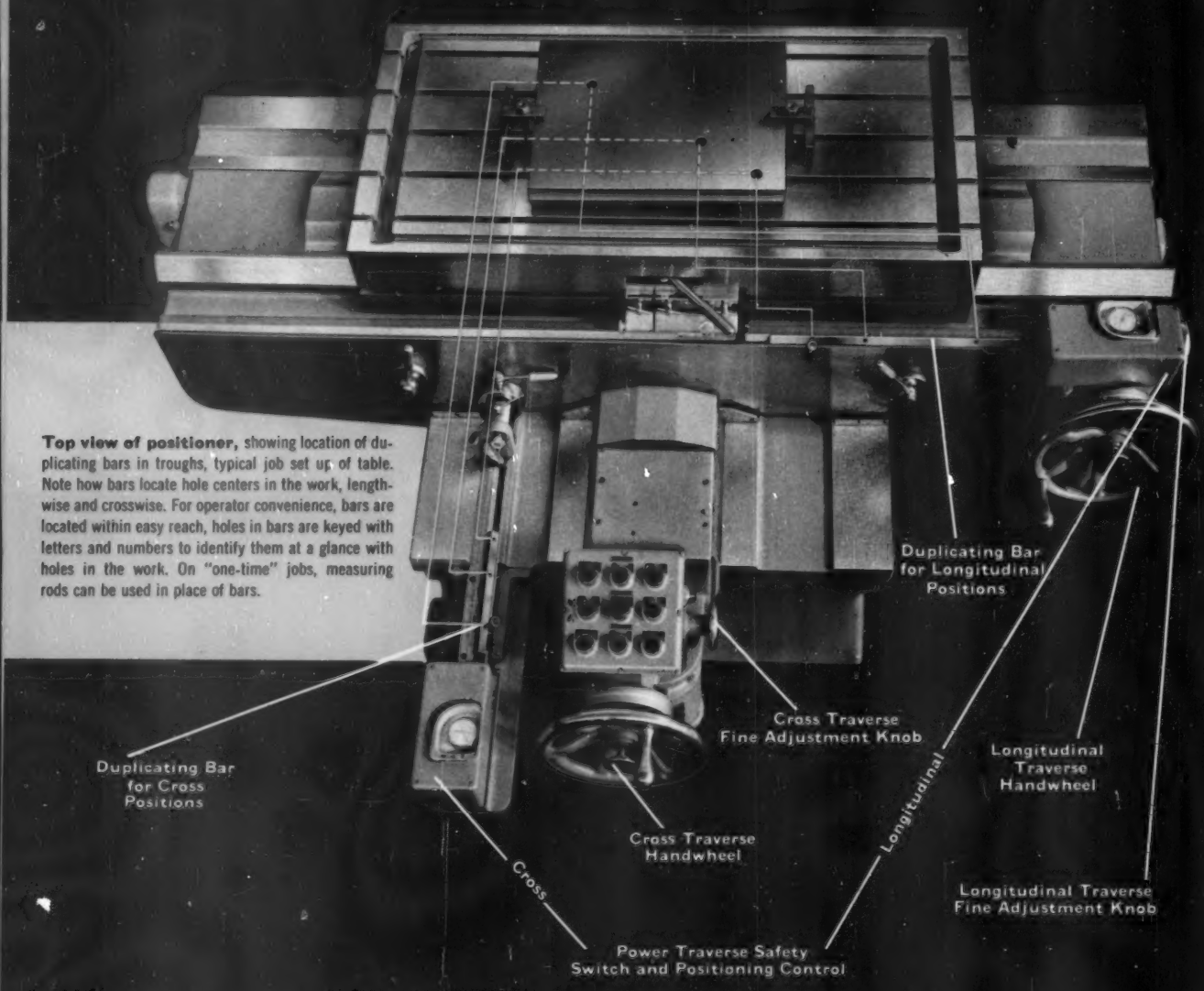
Simple to prepare—Average duplicating bar boring time is four minutes per hole.

Compact—You can store dozens of duplicating bars in the space needed for a single jig!

Permanent—Use them over and over again—weeks, months or years after they are made.

One set-up, any number of holes—Set up virtually any number of positions with one set of duplicating bars. This means even complex jobs with hundreds of holes require only one set up.

In operation, bars are placed in troughs. Pins—one for each duplicating bar—are inserted in holes in the bars. These pins establish individual lengthwise and crosswise positions. To change positions, operator simply moves pins, presses buttons and table moves to new position.



Top view of positioner, showing location of duplicating bars in troughs, typical job set up of table. Note how bars locate hole centers in the work, lengthwise and crosswise. For operator convenience, bars are located within easy reach, holes in bars are keyed with letters and numbers to identify them at a glance with holes in the work. On "one-time" jobs, measuring rods can be used in place of bars.

now available for use with radial drills

The Fosdick Automatic Positioner has been in use for over four years on Fosdick Jig Borers and Automatic Positioning Machines. It is tried and proven in the field, has boosted production on precision jobs as much as 250%. Now for the first time, Fosdick makes it available as a separate unit.

The Positioner can be quickly installed for use with your existing radial equipment. In your shop it will pay for itself many times over through savings in man-hours, set-up time, materials and storage space.

No jigs, no stop adjustments—
bars make permanent record of positions

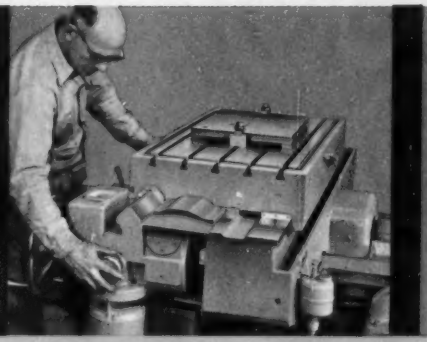
The Fosdick Automatic Positioner eliminates jigs and all the high costs that go with them—design, materials, fabrication, maintenance, storage. And no stop adjustments to bother with everytime you run a job! The duplicating bars replace both jigs and stop adjustments, make a permanent record of positions.

Precision production without an experienced operator

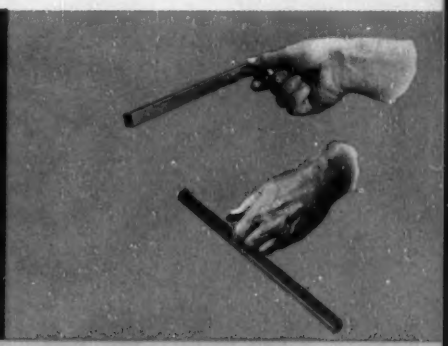
The Fosdick Automatic Positioner positions work to ± .0001". Using it with a good, rigid radial drill, you can hold extremely close tolerances. Once duplicating bars are made, the human element is eliminated. You can get precision, rapid production, without an experienced operator.

How you use the Positioner:

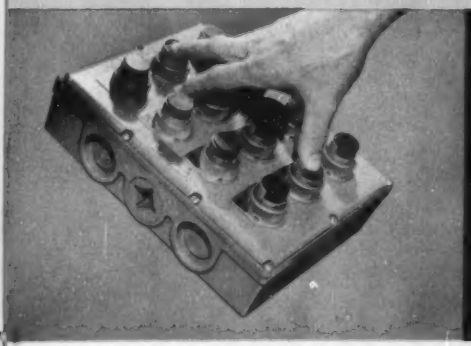
First put duplicating bars in their respective troughs. Place pins in holes that correspond to position of first hole to be drilled in work. Press buttons. Table moves to pin positions so that table and spindle are lined up for first hole.



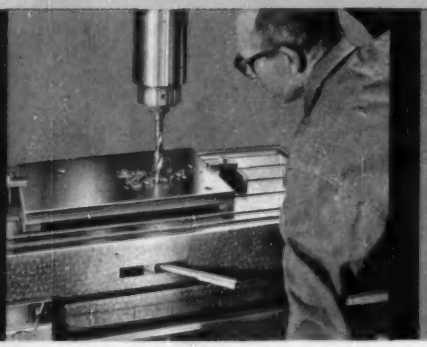
Position work on table so that center of first hole to be drilled lines up with spindle. Operator above is making final adjustment with Longitudinal Traverse Fine Adjustment Knob, to line up work and Positioner exactly with spindle. Another knob controls cross traverse fine adjustment. Drill first hole.



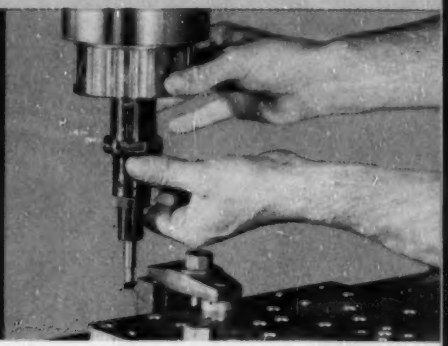
Ready for next hole. Move pins to lettered and numbered duplicating bar holes that correspond to position of next hole in work.



Press buttons—one for crosswise positioning, one for lengthwise positioning. Rapid traverse motor moves table to within 1/16" of final position. Then precision positioning motor automatically takes over, moves table to ± .0001" of final position. The motor then backs off to relieve all pressure between traverse screw and table.



Drill second hole. With all pressure gone, table stays put throughout drilling operation. Repeat this operation for each hole. Move pins, press buttons, drill hole. That's all there is to it! When job is finished, store duplicating bars until ready to run job again.



If you use the Positioner with a Fosdick Economax Radial Drill—BF Spindle equipped—you can change tools in seconds, while the machine positions. Get tolerances within tenths on hole size, even after dozens of tool changes!

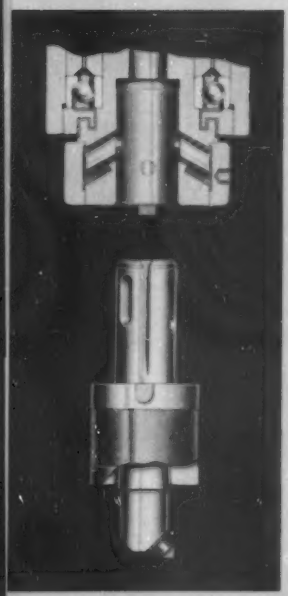
USE THE AUTOMATIC POSITIONER WITH ANY GOOD, RIGID RADIAL

Can be very easily installed for use with your existing radial equipment. Rigidity, true-running spindle are, of course, essential to get fine precision. Because the Positioner moves the work, the radial is used in clamped position with spindle located stationary.

SPECIFICATIONS OF FOSDICK POSITIONER

Table longitudinal travel	power 42", hand 43"
Table cross travel	power 22", hand 23"
Working surface of table	22" x 44"
Top of table to base of radial	31"

Fosdick BF Spindle Gives precision tool changing in seconds!

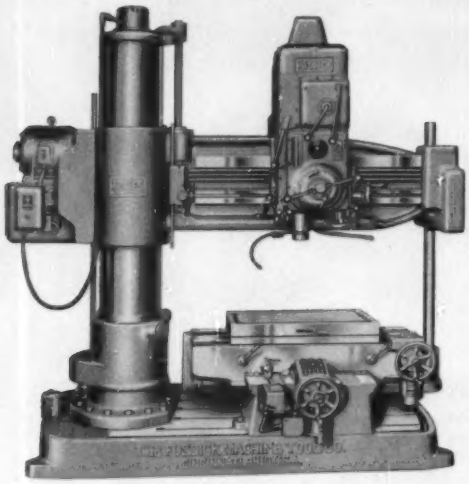


No more "cut and try" resetting of boring tools every time you change. With the BF Spindle (extra equipment) on a Fosdick Radial, you can change tools with such accuracy that hole sizes are repeated within tenths, *without* resetting, *without* jigs. Changing takes less than 10 seconds! You can slash time drastically on production work where repetitive precision is essential.

High-precision tool holder is built right into the spindle of the Radial. Straight-shank tool adapters fit holder precisely—close fit wipes surface clean as adapter is inserted, keeps dust and dirt from upsetting precision fit. Adapters accommodate both standard and special-sized tools.

The Fosdick Economax Radial Drill Hydraulically Controlled Throughout

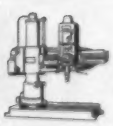
Rigid, reinforced construction plus ease of operation give you smooth positive action *on any job.* Controls are grouped conveniently around the head for maximum operator efficiency. Outstanding features include:



Patented hydraulic arm and column clamps
Clamping interlocked with controls for ease of operation
Superfinished column for added precision
Hydraulic safety nut
36 spindle speeds, 18 feeds
11" to 19" columns, 3' to 8' arms

WRITE FOR BULLETIN 37

Need Drilling Equipment? Get a Proposal from Fosdick!


Radial Drills

Jig Borers

Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

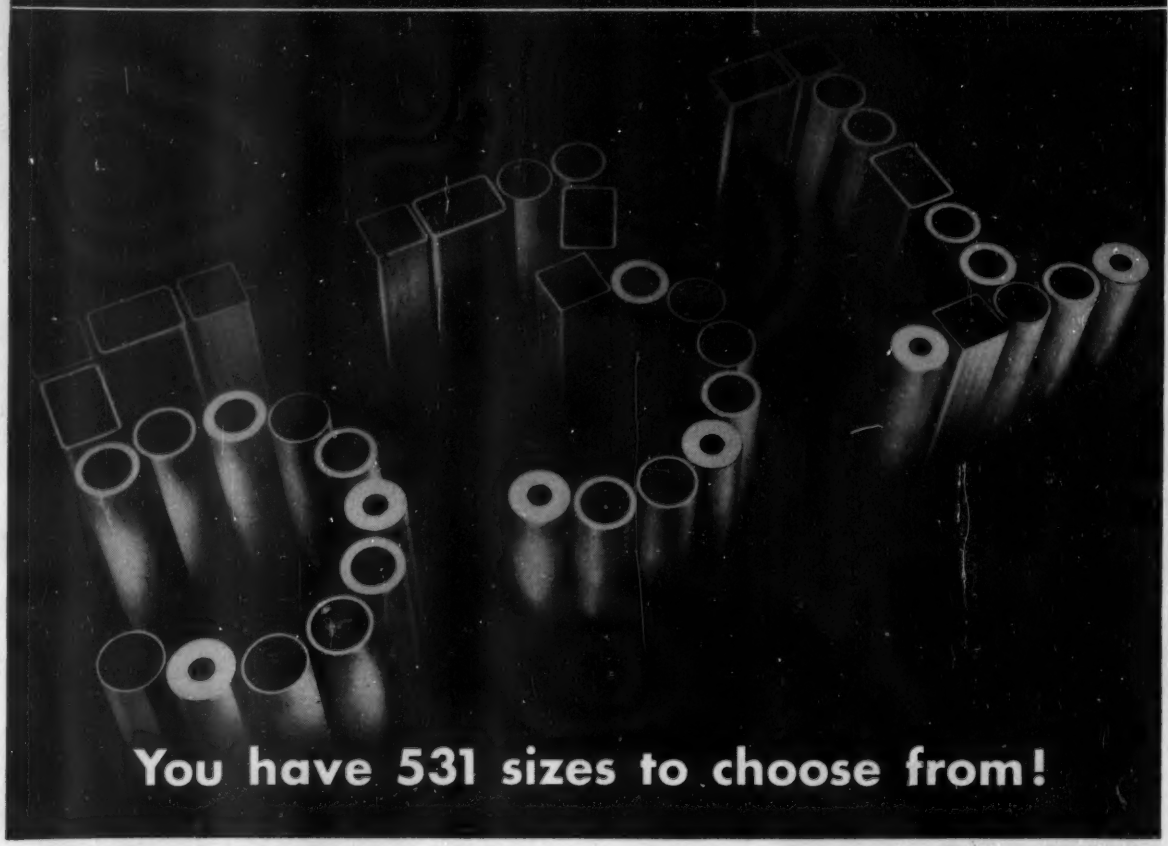
FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

5M-4-54-YK

Litho in U.S.A.

WHY IT PAYS TO BUY MECHANICAL TUBING FROM US



You have 531 sizes to choose from!

WE carry no less than 531 sizes of Shelby Seamless Mechanical Tubing and can fill orders promptly . . . by the inch or by the carload. No matter what your tubing needs, we can supply you with the best for the job — tubing manufactured by the world's leading producer, National Tube Division of United States Steel.

Our experience in the field of tubing applications has often saved large sums of customers' money—for it is sometimes possible to substitute a more economical type of tubing than you had planned to use.

We carry everything you need. Call us for: mechanical tubing, round and square, seamless and welded; boiler tubing, pressure tubing and pipe; stainless steel tubing, seamless and welded, and stainless pipe.

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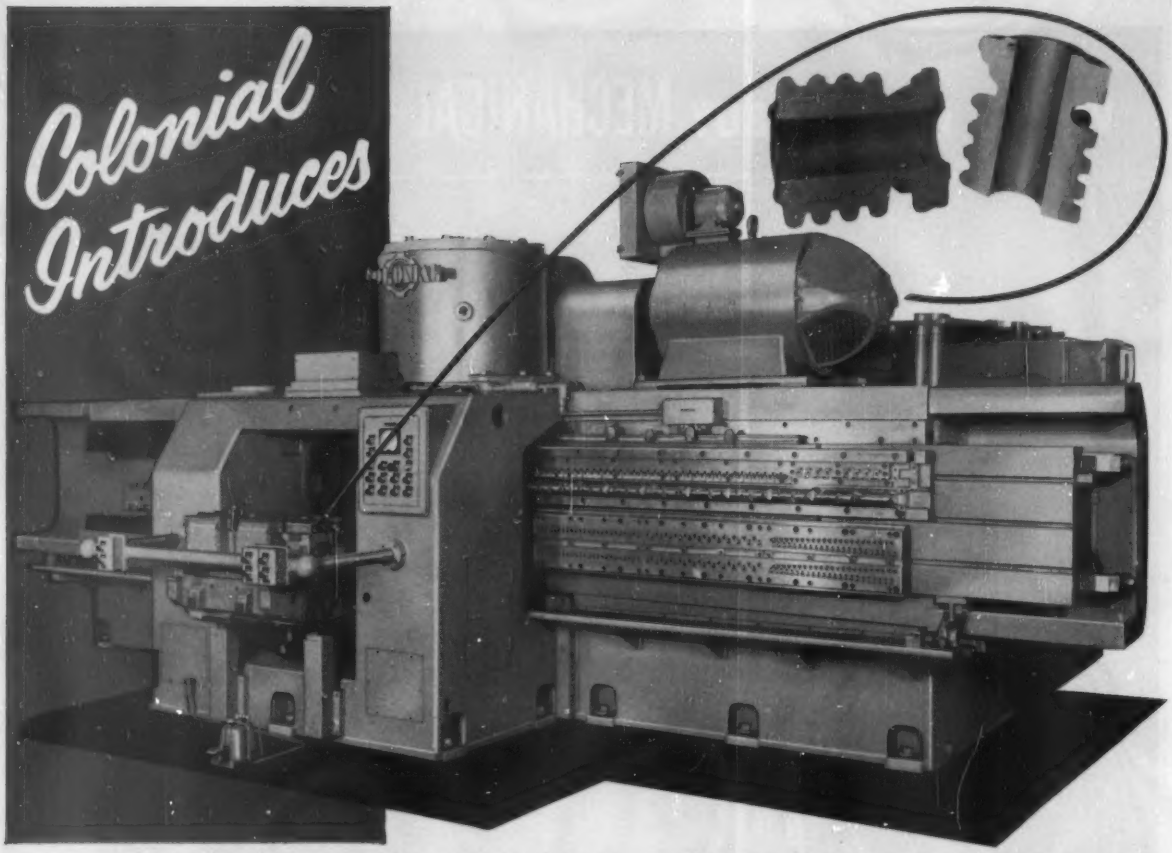
UNITED STATES STEEL



the MECHANICAL HORIZONTAL

for faster broaching of surfaces

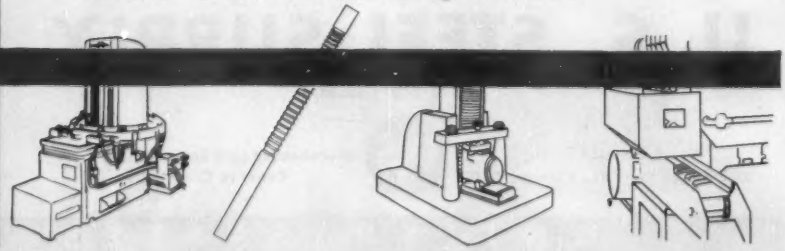
The model HM-25-130, is the first in a new line of Colonial MECHANICAL HORIZONTALS. It removes 3½ pounds of metal, with depth of cut varying from 5/32 to 3/16 of an inch, in a 21-second broaching cycle from two cast iron bearing cap clusters. Tungsten carbide-tipped tool bits mounted on the 24" wide ram, travel at more than 140 feet per minute. The machine broaches on both the forward and return strokes, doubling the length of cutting action as compared to ordinary broaching. The machine has a 130-inch stroke and 25-ton capacity. Broaching speed is variable (30 to 150 sfm) through rheostat control of the direct current 150 hp motor.

Trunnion-type fixture has hydraulic clamping, positioning, and shuttling. All automatic cycle hydraulic and electrical controls are interlocked, and this equipment is installed according to J.I.C. standards. Table level loading of work and floor level accessibility of the broach inserts and practically all operating parts are important features of the machine. Floor space is 194 x 290 inches.

This is a Colonial Unified Broaching Installation.

Unified Broaching

COLONIAL



Partial view of the aluminum die cast department of the Tri-State Die Casting Co., showing Cleveland Model 400's producing the Servel Automatic Ice Making Unit.

Servel "IceCircles" take shape...

in CLEVELAND die casting machines at Tri-State Die Casting Co.

The ice-making unit, the aluminum casting shown at left, for the unique Servel Automatic Ice-Maker Refrigerator, is produced by the Tri-State Die Casting Co., Henderson, Ky., in a battery of Cleveland Model 400 Die Casting Machines.

The high metal injection pressure obtainable with the Cleveland Model 400 assures a sound, dense casting, free of all porosity and surface defects . . . highly important in this aluminum casting as any slight imperfection could cause difficulty in dislodging the ice from the mold. "*Scrap on this job is practically nil*" is the report from Tri-State, indicating the high quality of the *hardware finish* castings delivered by the Cleveland machines.

This is another example of how the nation's leading die casters rely on Cleveland dependable performance. To get the most from *your* die casting department—in speed of production and quality of casting—investigate the advantages of the Model 400 Cleveland. Bulletin 400 gives you complete information. Write for your copy.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4328 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
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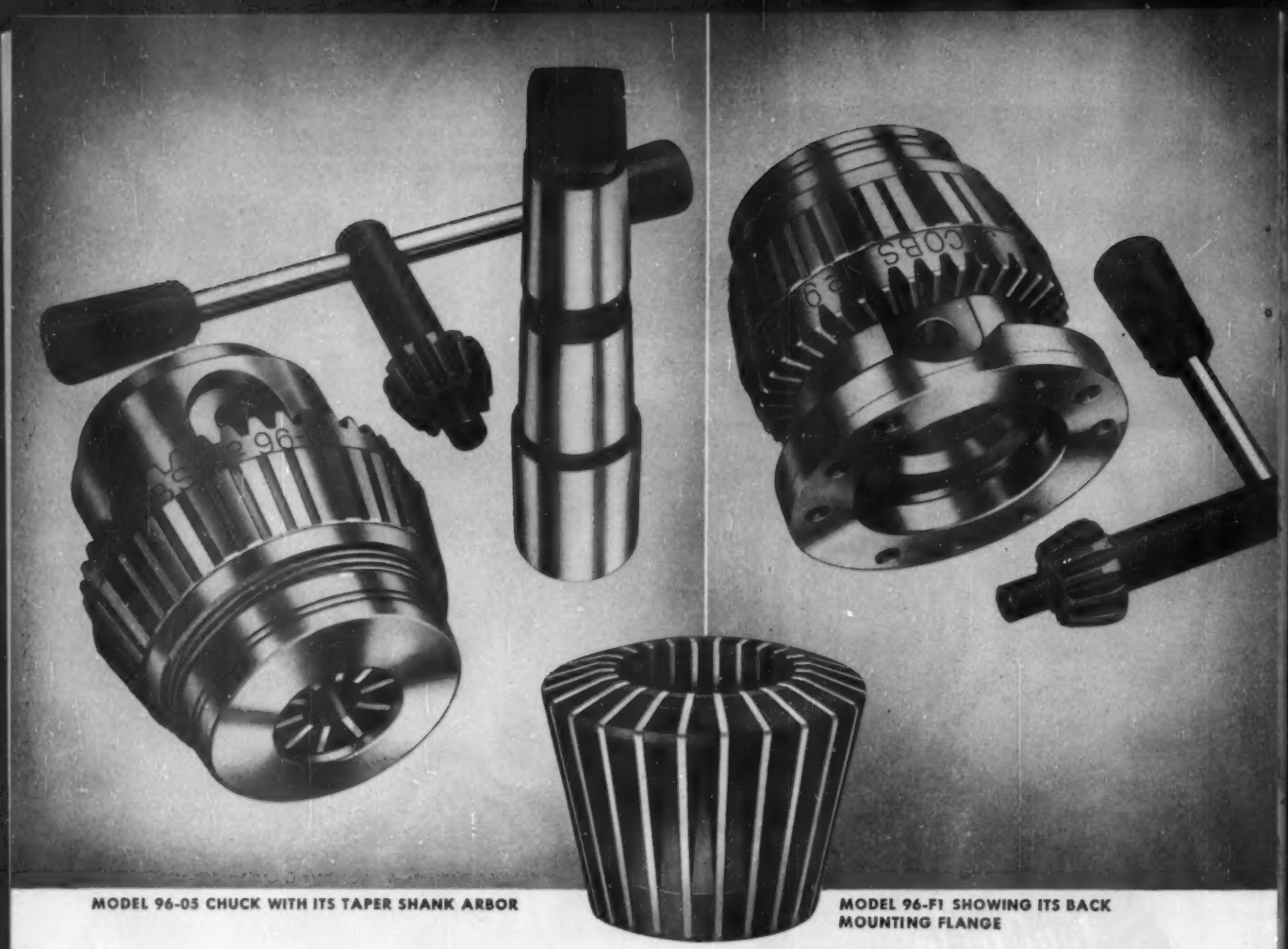
Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines



MODEL 96-05 CHUCK WITH ITS TAPER SHANK ARBOR

MODEL 96-F1 SHOWING ITS BACK MOUNTING FLANGE

NOW! New Jacobs Model 96 Rubber-Flex Collet Chuck

brings famous grip to whole new group of applications

Grinders! Milling machines! Jig borers! Jig grinders! Lathes! Various types of special machinery where precise compact collet closure is vital!

ALL get the benefit of the famous Jacobs Rubber-Flex Collet grip in the new Jacobs Model 96 Collet Chuck.

The long, steel jaws of this collet — locked together with oil-resistant synthetic rubber — provide an absolutely parallel grip over the entire bearing surface.

What's more, each collet has a full ⅛" range so that the standard set of eleven Rubber-Flex Collets cover the gripping range of eighty-eight split steel collets! A geared key tightening device and self-tightening toggle action of the collet jaws give the chuck gripping power far beyond that obtained with split steel collets. Chucks any diameter bar between 1/16" and 1⅜".

For work holding: Model 96 Collet Chuck permits precision chucking of bright finished bars, with close or wide tolerance diameters, resilient or compressible materials, tubing and brittle materials such as ceramics or glass.

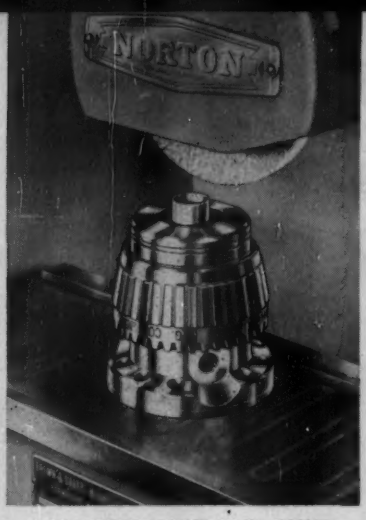
For tool holding: Model 96 Collet Chuck can be used for drilling and reaming on jig borers and other high precision machines, holding proving bars and indicators. Extreme accuracy and wide capacity range make it ideal for tool and cutter grinding on cylindrical and cutter grinders.

TWO MODELS: Model 96-05, $135.00; Model 96-F1, $150.00. Rubber-Flex Collets, $12.00 each.

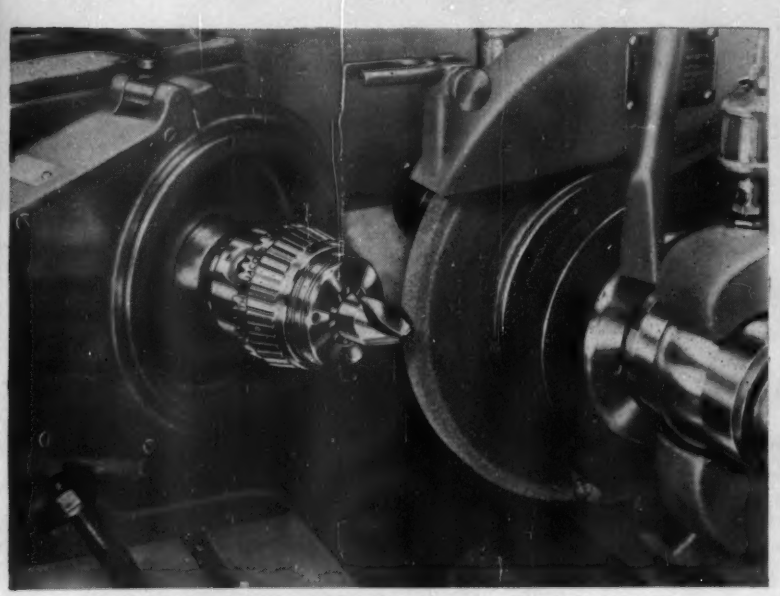
For further details, ask your Industrial Supply Distributor for Catalog 54-CC. The Jacobs Manufacturing Company, West Hartford 10, Conn.

Jacobs RUBBER-FLEX COLLETS

PRECISION REAMING ON JIG BORER with Model 96-05.



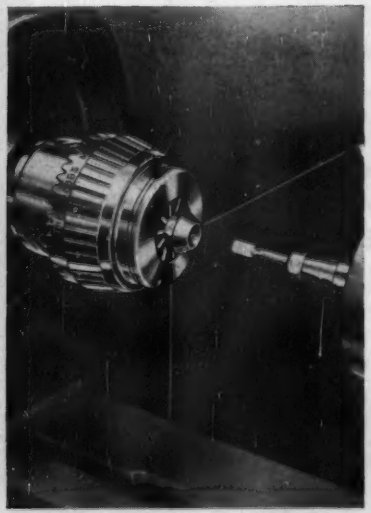
NEW JACOBS MODEL 96-F1 COLLET CHUCK on magnetic chuck holds work for surface grinder.



MODEL 96-05 ADAPTED TO HEADSTOCK OF CYLINDRICAL GRINDER.

CHUCKING WORK ON VERTICAL MILLING MACHINE with Model 96-F1.

NEW CHUCK Model 96-F1 here holds work on jig grinder.



PRECISION BUSHING GRINDING with Model 96-05.

IF IT'S A

JACOBS

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Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

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For all Sizes of Monarch Lathes*... For Quality & Quantity Improvements Like These!

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Reasons for its productivity are simple. Less setup time. Simpler and infinitely less expensive tooling. Less tool sharpening time. Less turning time. Less grinding time on subsequent operations. To all this—add the speed, accuracy and inherent advantages of automatic control.

Don't you want more data on a package like this—as effective for short runs as long ones? Just write today for our complete, fully-illustrated Booklet #2607 . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

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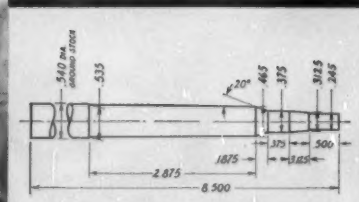
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

TYPICAL SMALL LATHE APPLICATION

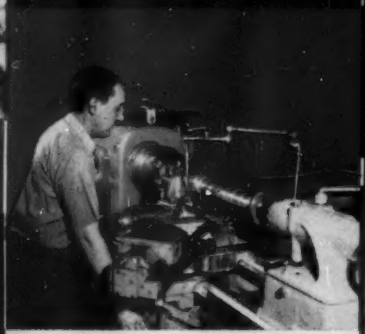
Monarch 10" Model EE Precision Manufacturing Lathe with Type C Rigid Air-Gage Tracer



Part—reamer blank. **Material**—high speed steel. **Operation**—turn complete except .540" diameter. **Limits**—±.001". **Maximum depth of cut**—7/64". **Comment**—three cuts are required to avoid springing work. Yet total machining time of 3 minutes, 36 seconds was achieved at once by operator new to Air-Gage Tracer equipped machine. Customer estimates that savings will pay for machine in less than one year.

TYPICAL MEDIUM LATHE APPLICATION

Monarch 16" Series 60 Engine Lathe with Air-Gage Tracer and Auto Cycle Unit



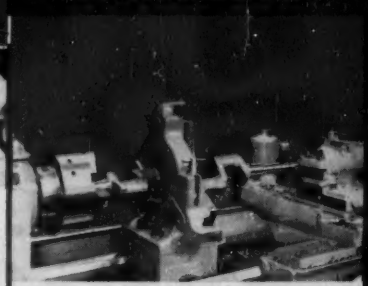
Turning rotor drive shaft. A flat template is used for this operation but round templates may be employed if desired. Stylus operates on only 5-6 ounces of pressure.

Part—helicopter rotor drive shaft, 36" long. **Material**—4340 steel forging, brought to hardness of 34 to 38 Rockwell C scale. **Operations**—finish turn and bore. **Limits**—±.001" on some diameters. **Comment**—accuracy and finish are the story here.

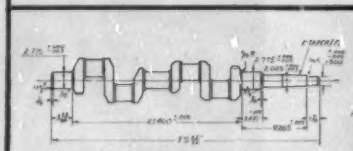
To obtain proper grain structure in the finished parts, the rough forgings are made substantially oversize. Finished parts average only 20% of the weight of the rough forging, and are completely free of distortion. User, having found previous modern equipment incapable of holding limits, expresses complete satisfaction with Monarch production.

TYPICAL HEAVY DUTY LATHE APPLICATION

Monarch 20" Model M Heavy Duty Lathe With Type C Rigid Air-Gage Tracer

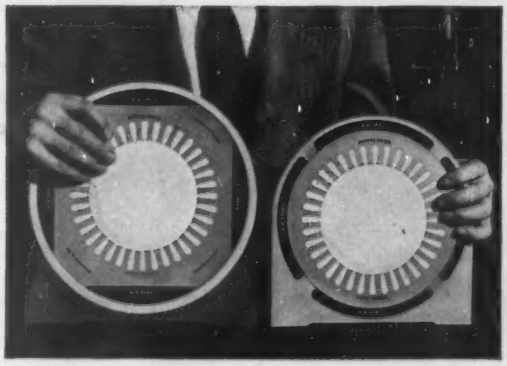


Turning crankshaft (above). Note that tool, mounted not on hydraulic slide but on its own slide, can be adjusted for diameter changes by dial calibrated in thousandths—without altering template setup.

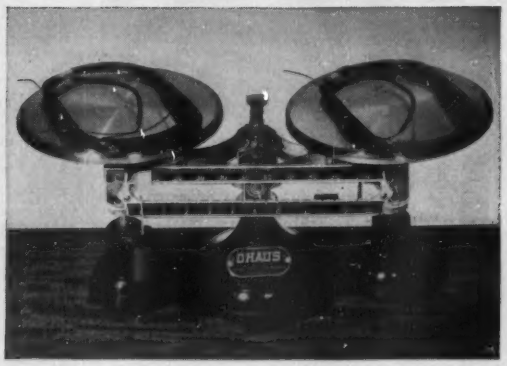


Part—crankshaft. **Material**—4140 forging. **Operations**—finish turn both ends. **Limits**—±.002". **Maximum depth of cut**—3/16". **Comment**—use of steady rest permits holding of limits, reducing spring normally present when turning such long, out-of-balance parts. With 2 cuts required on long end (above) because of large amount of stock removal from small end diameters—total turning time per piece is only 3 minutes, 5 seconds.

Here are laminations from two 5-hp Life-Line motors. Note that only the inactive support corners of the original Life-Line square stator have been eliminated from the round stator of the Life-Line "A" motor.



When the stators are placed in their respective frames we see how the Life-Line "A" size reduction has been accomplished without sacrificing active magnetic steel. Excess air space has been eliminated also.



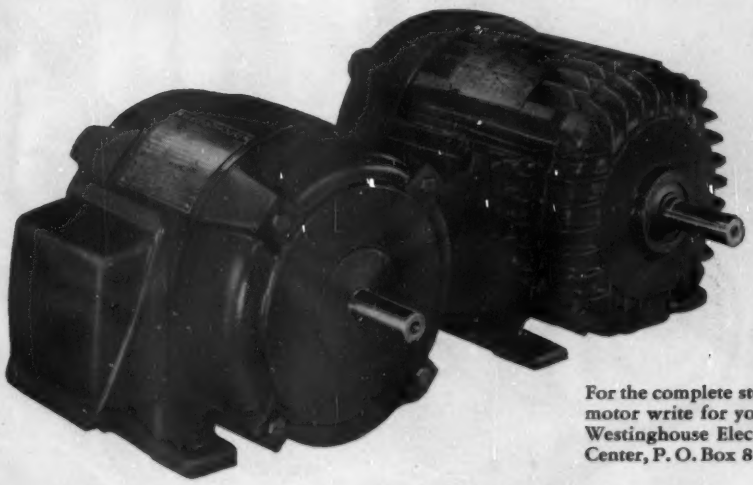
Copper, the other important active material, has not been sacrificed. The coil on the left is from an original Life-Line motor. The coil on the right is from a new Life-Line "A" motor. Both weigh the same.

Here's how more horsepower has been put in the Life-Line A motor

These demonstrations show how motor performance is determined by "active" material

Perhaps you are a motor user who has raised the question: "How can you shrink the size of a motor and still equal or better the original performance?" Let's look inside a motor to find the answer.

The performance of any motor is dependent upon its active material—the magnetic steel and copper. Take the original Life-Line® and the new Life-Line "A" for example. The amount of magnetic steel in the stator and rotor and the copper in the coils of both Life-Line designs are the same. The reduction in size has been accomplished by eliminating inactive material and space. Thus you have a smaller motor whose basic electrical performance remains unchanged. In fact, the Life-Line design principle has been proved in service for over seven years. J-21848



For the complete story on the new Life-Line "A" motor write for your copy of Booklet B-6154. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE...IF IT'S

Westinghouse

● Much more than mere salesmen, Standard's lubrication engineers are "Johnny-on-the-spot" when it comes to checking performance, offering advice on new products and otherwise being helpful. Here is J. E. Meyer, Jr. at work in the Trane Company plant. *You* can have advice and service like this. Call your nearby Standard Oil office or write: Standard Oil Company, 910 S. Michigan, Chicago 80, Ill.

the thread of this story depends on...

SUPERLA
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Soluble Oil

● The coils manufactured by the world-famous Trane Company in La Crosse, Wisconsin are the heart of the heating and cooling equipment manufactured by this company. Threaded cast iron headers are used in many of these coils. The job requires cleanly threaded, cleanly finished holes that must be absolutely rust-free to assure maximum trouble-free operation.

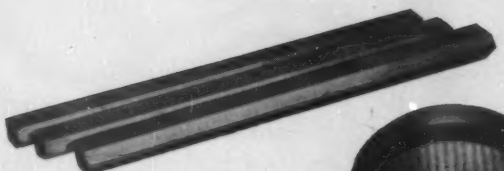
Up to 1936, various soluble oils had been tried but none was successful in eliminating work spoilage due to rusting. On the advice of a Standard Oil lubrication specialist a switch to SUPERLA Soluble Oil was made with marked success.

Rejections due to rusting threads have been completely eliminated. At the same time, the quality of the threads has been excellent. In addition working conditions have also been greatly improved—with SUPERLA on the job, there's been no odor development, no gumming up of machines.

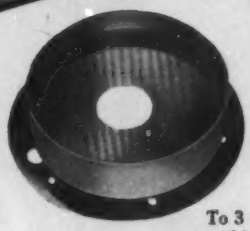
SUPERLA Soluble Oil can help you find a happy solution to your lubrication problem. SUPERLA forms stable emulsions . . . helps provide good finish and tool life and has superior rust prevention properties. Call your Standard lubrication specialist today and find out how he can help you.

STANDARD

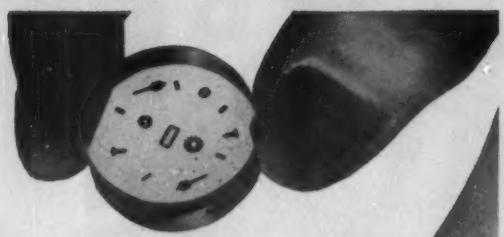
STANDARD OIL COMPANY
(Indiana)



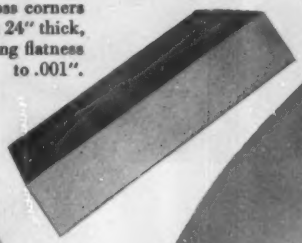
Hardened steel machine tool ways, 2½" x 3½" x 50", ground on 6 sides, flat within .001" with surface finish of 5 micro-inches—*5 times faster than other methods!*



To 3 micro-inches and flat within *one* light band.

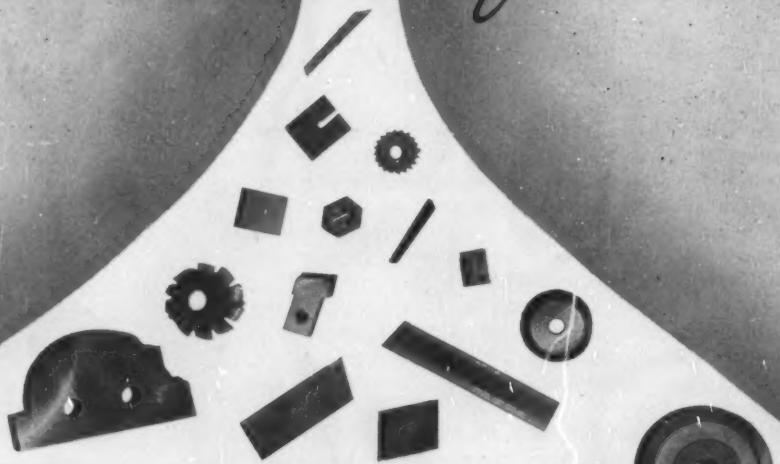


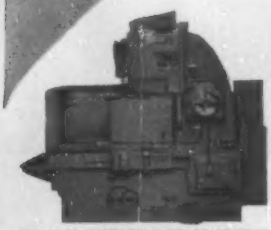
Tiny watch gears, pinions and ruby bearings—flat and parallel—to a dimension tolerance of .0002".



Die plates, 84" across corners and perhaps 24" thick, holding flatness to .001".

"Specs" like these call for Blanchard





NO. 18 BLANCHARD SURFACE GRINDER

Every day, parts like these are ground accurately and rapidly on Blanchard Surface Grinders equipped with Blanchard Abrasive Wheels. They're ground economically too—at costs which help you set competitive prices.

Send a sample of your parts for free test grinding and recommendations.

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POLISH THIS FILLET AFTER GRIND
UNDERSIZE 1 THEN CHROME PLATE .020 ON DIAMETER.
THIS WILL ALLOW .010 FOR GRINDING TO FINISH
DIMENSION
NOTE:
CARBURIZE .046 DEEP
ROCKWELL C 61/63

why you should put SUPERFINISH in your blueprints

Longer life, better performance—yes, and *lower costs, too*—should be engineered into the product at the start. For example: when you specify Gisholt SUPERFINISH, you accomplish two things: First, you assure a bearing surface free of the imperfections that cause wear—a surface that will last indefinitely. Second, you cut the cost of grinding—or even eliminate it. Surprisingly enough, you can in most cases achieve this superlative finish at lower over-all cost than is possible with other methods of finishing.

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Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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Madison 10, Wisconsin
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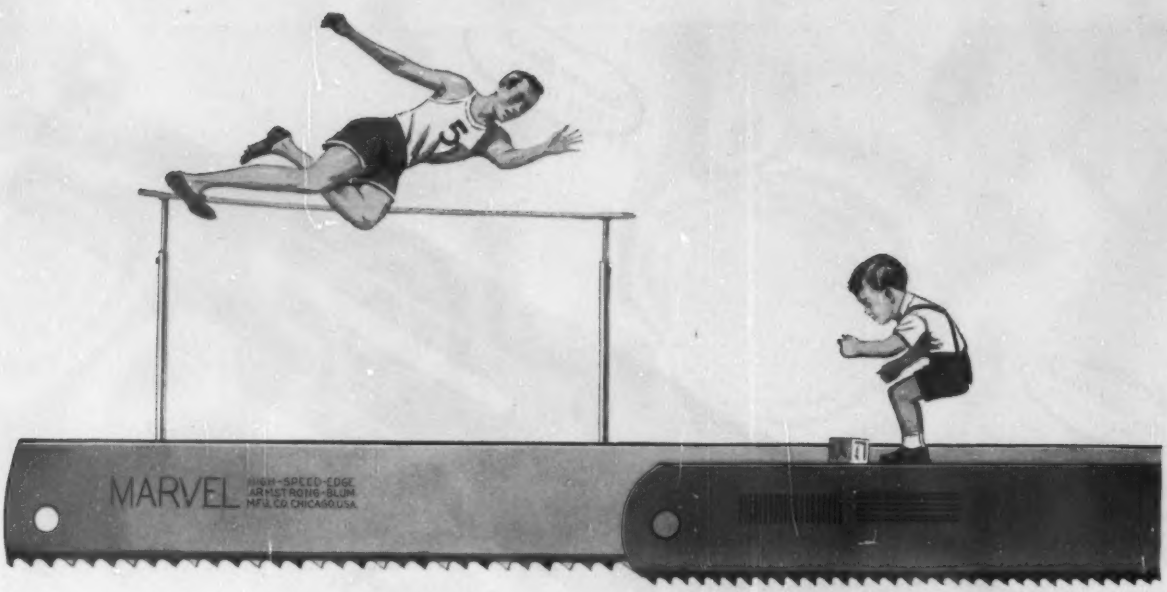

. . . *but*
Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate — without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!

MARVEL *Metal Cutting* SAWS

Better Machines-Better Blades

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with no Work Pressure on the Screw

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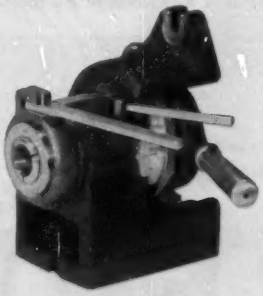
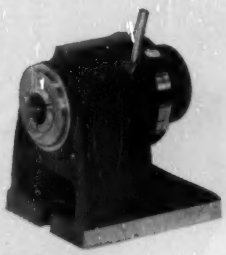


H-4 Tool Room-Inspection



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A CASE HISTORY: One of our customers had an extremely difficult problem of burring some piece parts after assembly. After consultation with Atrax engineers, it was determined that Solid Carbide Burs were the only type that could be used to salvage this huge job. Six Carbide Burs were bought for this job, totalling approximately $100.00. They saved the company over $3,000.00 in labor. Besides this, they made possible salvage of very valuable piece parts for a very nominal original investment.

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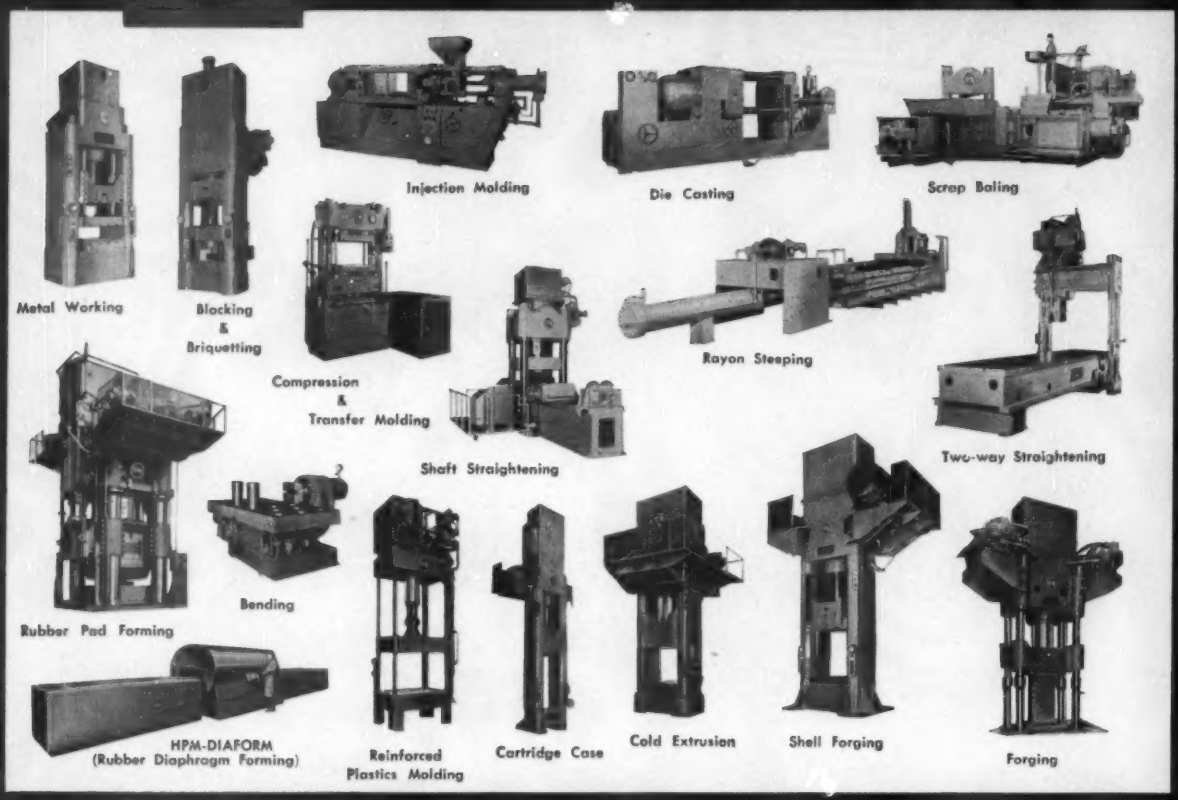

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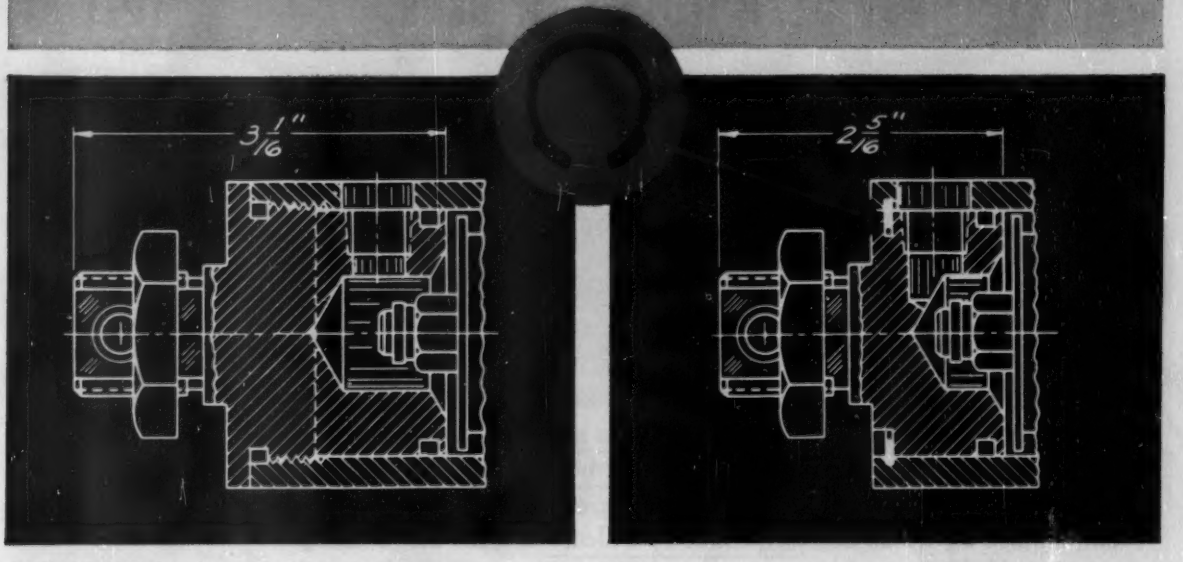
Waldes Truarc Rings Cut Costs $3.26 per Unit, Reduce Size and Weight of Air Cylinder!



OLD STYLE air cylinder, with thread-secured head, required costly tapping, chasing and assembly operations. Also, satisfactory maintenance of packing unit necessitated use of pipe wrenches on painted surfaces.

NEW cylinder head is secured with precision-ground Waldes Truarc Rings. This produces perfect alignment of head within the housing, difficult to obtain with screw-thread seating. Maintenance is quick and easy.

WALDES TRUARC RINGS PERMITTED THESE SAVINGS

Production Time Cut..17 minutes
Weight Saved.....1¾ lb.
Length Shortened.....1½ inches
Cost Saved.....$3.26 unit

■ The A. K. Allen Company of Brooklyn, New York, maker of *AllenAir* cylinders, now uses two Waldes Truarc Inverted Rings (series 5008) to secure heads rigidly within tubes.

■ TRUARC Rings, in this application, are ground parallel by A. K. Allen to .001 tolerance. In a static hydraulic bursting test, the 3" unit (recommended for 350 p.s.i.) withstands a pressure of 2000 p.s.i. And at bursting-point, the brass groove gives way; the Truarc Ring remains intact.

■ Waldes Truarc Retaining Rings are precision-engineered . . . quick and easy to assemble and to disassemble. They can be used over and over again. There's a Waldes Truarc Ring to answer every fastening problem.

■ Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers.

For precision internal grooving and undercutting . . . Waldes Truarc Grooving Tool

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AM056

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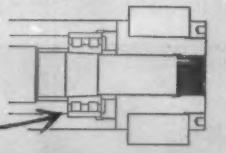
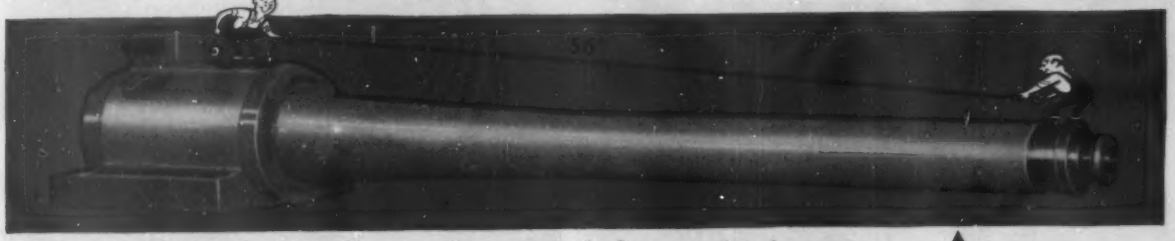
TAKE THESE DEEP HOLE SPINDLES, FOR EXAMPLE

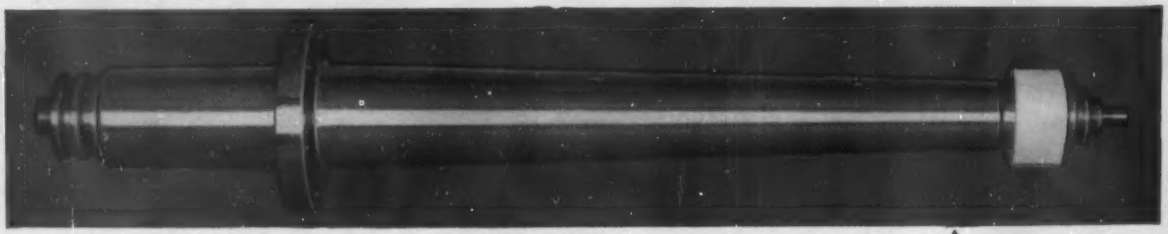
Only POPE Deep Hole Spindles are equipped with tapered bore, double row, cylindrical roller bearings close to the wheel for maximum rigidity.





▲ Pope P-5886 Motorized Deep Hole Spindle — 75" overall length, 4" barrel diameter at the wheel end, 6" at the motor end

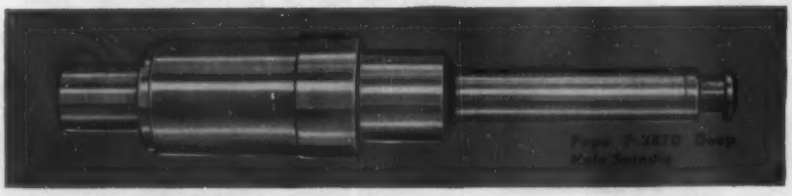
POPE Deep Hole Spindles produce more holes per day because they can take heavy cuts; superior finished holes due to their shaft and bearing construction and Pope precision craftsmanship. Pope Spindles are dynamically balanced with all rotating parts in full assembly to insure smooth running and good grinding results.



▲ Pope P-16022 Belt Driven Deep Hole Spindle

LUBRICATION — Pope System. The bearings are permanently lubricated for their entire operating life and require no further attention.

— an actual comment made by the operator of a Pope Deep Hole Spindle to a shop inspector.



Ask for detailed specifications and prices on Pope Heavy Duty Deep Hole Precision Spindles.

No. 98

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POPE MACHINERY CORPORATION

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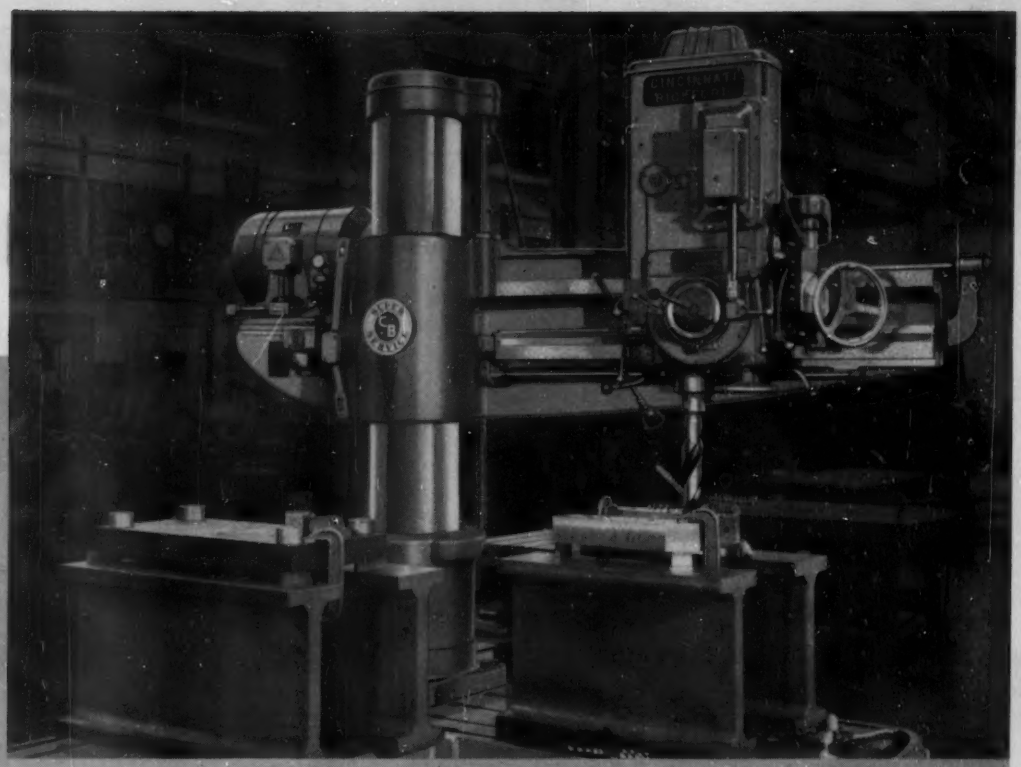

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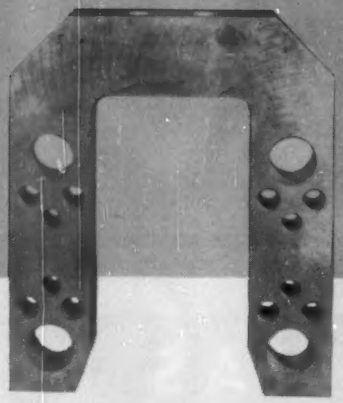
PROGRESSIVE DIES, TOOLS, JIGS, FIXTURES



The piece shown is an anvil on horn tube Pierce die.

Photos courtesy Koppy Tool & Die Company, Ferndale, Michigan

The capacity and performance of this Cincinnati Bickford Super Service Radial has effected real savings in the shop at Koppy Tool & Die Company. On the operation shown a 50% saving was effected with the installation of this new Bickford Super Service Radial. eighteen holes are being drilled from 1 27/64″ to 3″.

Write for Catalog R 29 on Super Service Radials—there's a size for your needs.

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RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

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GRINDING...POLISHING... SANDING...FINISHING?

"SKIL has the answer" in all metal working with more specialized types of Sanders and Grinders than *any* other manufacturer. Only with SKIL can you select exactly what you need for your job!

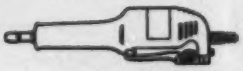
SEE HOW ONLY SKIL HAS ALL THE TOOLS TO DO EVERY METAL FINISHING JOB

Manufacturer	Disc Sanders	Spindle Grinders	Electric Hand Grinders	Pneumatic Hand Grinders	Belt Sanders	Oscillating Sanders	Bench Grinders	TOTAL
SKIL	6 Models	4 Models	3 Models	3 Models	5 Models	1 Model	5 Models	27
"A"	4 Models	3 Models	1 Model	——	——	——	3 Models	11
"B"	4 Models	3 Models	——	2 Models	2 Models	——	5 Models	16
"C"	4 Models	2 Models	——	——	——	——	4 Models	10
"D"	2 Models	——	——	1 Model	1 Model	——	2 Models	6
"E"	——	——	——	——	4 Models	2 Models	4 Models	10
"F"	2 Models	3 Models	——	——	——	——	4 Models	9

SEE HOW "SKIL HAS THE

SKIL Portable Grinder

Disc Sanders


Hand Grinders

Belt Sanders

Oscillating Sanders

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ANSWER"

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You're using the same heavy disc sanders you have had for years. Your men tire using them—complain about lack of power to do the job right. Naturally, production suffers, time is lost. SKIL has the answer in two new light weight SKIL 7" Disc Sanders with *30% more power!* These tools are *ideal* for use with sandpaper discs, cup grinding wheels, wire brushes and reinforced raised hub discs.

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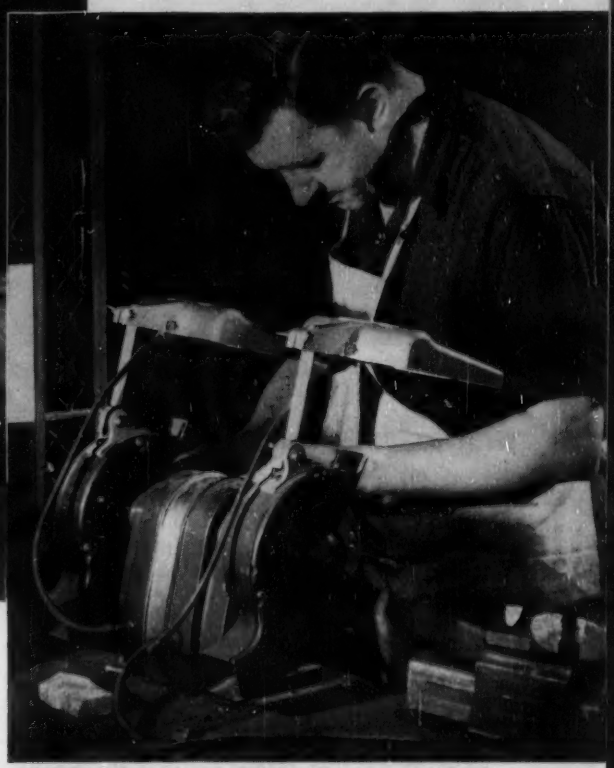
How many steps per day do your men waste carrying tools or work to a distant bench grinder? Steps that mean lost time, lost production dollars? Break *this* "bottleneck" with the *new* SKIL 6" Bench Grinders by spotting several of them around your shop in strategic locations where your men can get to them in the fewest minutes possible.



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Your "good old lathe" may be an economic liability. Check the short-comings of your present lathes against the profit possibilities offered by modern Lodge & Shipley Lathes.

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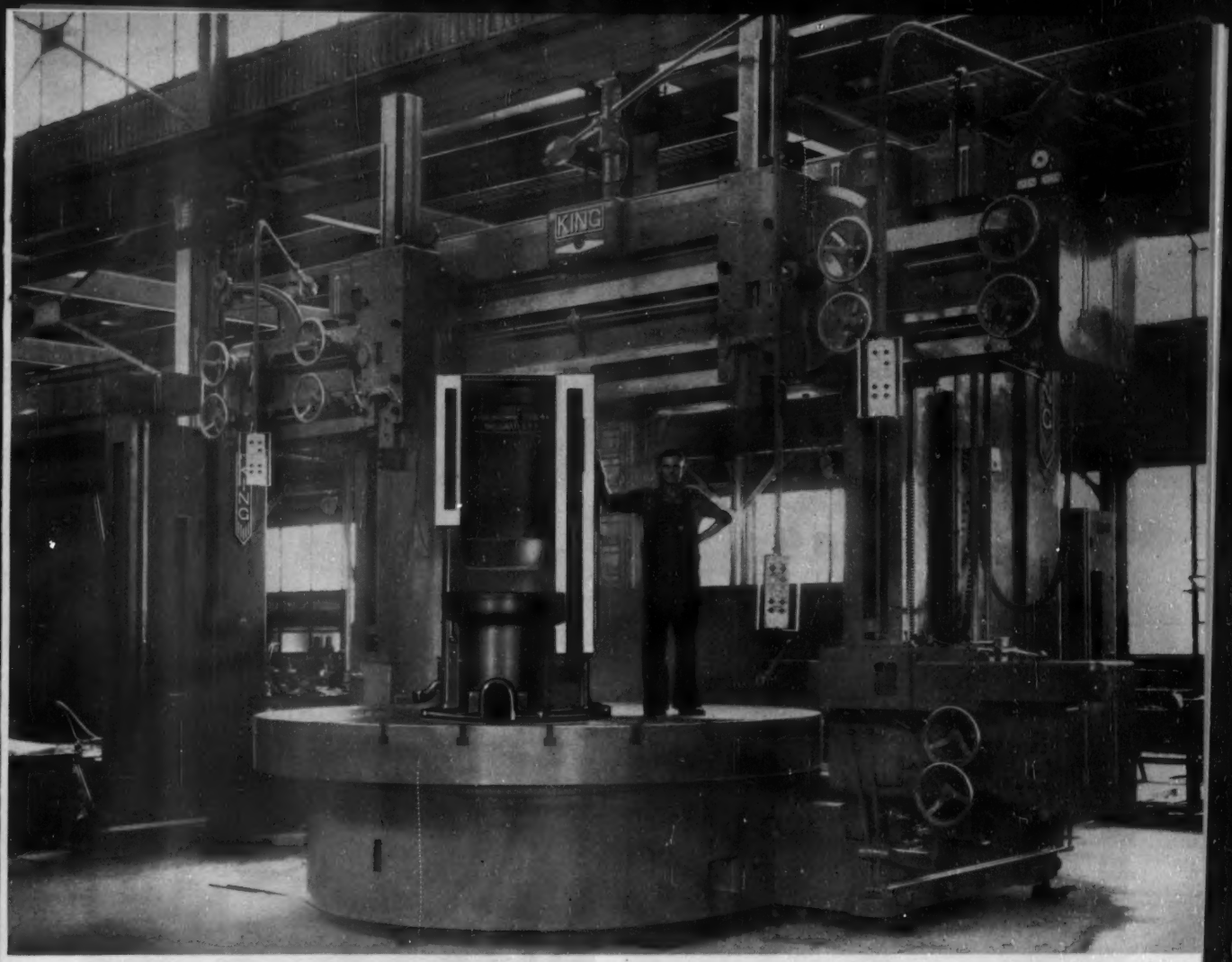
THE **Lodge & Shipley** COMPANY

CINCINNATI 25, OHIO

Spiraling smoke accents the speed with which this Lodge & Shipley Model X 25" Heavy Duty Lathe is taking a heavy cut on a machine spindle.

ENGINE, TOOLMAKER, MANUFACTURING, GAP AND OIL COUNTRY MODEL "X" LATHES, COPYMATIC, DUOMATIC AND T LATHES



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30" to 144"

VERTICAL BORING & TURNING MACHINES

Pictured above, on the table of a massive 144" KING® Vertical Boring & Turning Machine, is the base and column of a rugged 30" KING . . . the "big" and "little" of the KING size range. KING and *only* KING "covers the field" with ten sizes: 30" and 36", one head on rail—42", 52", 62", 72", 84", 100", 120" and 144", one or two heads on rail. All size KINGS are available in a variety of head combinations, with or without side head.

KING'S wide size range lets you select the *right* size machine to fit *your* boring, facing, and turning requirements. These extra-heavy, extra-rigid machines have the speed, power, ease of control, and dependable accuracy that are essential for turning out your work with maximum efficiency in minimum time. See your KING distributor—or write us direct —for complete information on the many outstanding features of KING machines.

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HERE'S WHAT CAN BE DONE WITH STANDARD RIGIDMILS...

To Solve Special Milling Problems

On standard Sundstrand Rigidmils, the head is a self-contained unit which can easily be replaced with a special head. Consequently, when production or work requirements permit machining several surfaces simultaneously, the standard head can be replaced with a special head, and a *special* job done with the lowest possible capital investment. Furthermore, putting into effect product changes (a difficult problem for many production engineers) doesn't worry anybody in plants where Rigidmils are installed. As these machines can be converted so readily to meet production changes, they represent a combination of maximum production with minimum capital investment. Here are six good examples of standard Rigidmils "engineered" to a production job with "only the head as special".

Vertical and Angular Pads Milled Simultaneously On Rigidmil With Special Head

This standard Sundstrand Model 22 Rigidmil has a special two spindle head for milling two pads on steering gear housing brackets. One head is fixed horizontally and the other has 10 degrees of angular adjustment. The work holding fixture holds one piece at a time and is hydraulically operated. Two pads, one angular and one vertical are milled in one pass of the table at the rate of 100 pieces per hour.

Rigidmil With Special 2-Spindle Head Mills Slots In Pump Rotors

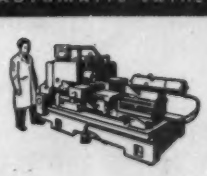
The special 2-spindle head on this standard Rigidmil simultaneously mills 2 vertically opposed slots in pump rotors. The machine handles 3 different sizes of rotors, which are held between centers of the tailstock and special indexing fixture. In an automatic cycle the table rapid approaches, feeds past the upper and lower slotting cutters and reverses for indexing. The action is repeated 6 times to mill the 12 slots in each part.

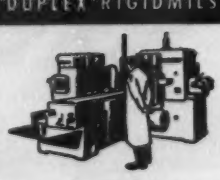
SUNDSTRAND

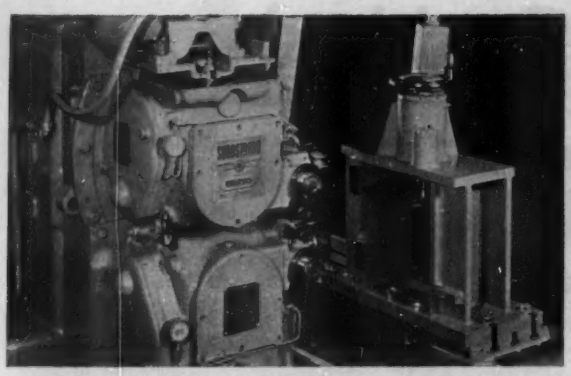
*"Engineered Production" Service**

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES · SIMPLEX RIGIDMILS · DUPLEX RIGIDMILS

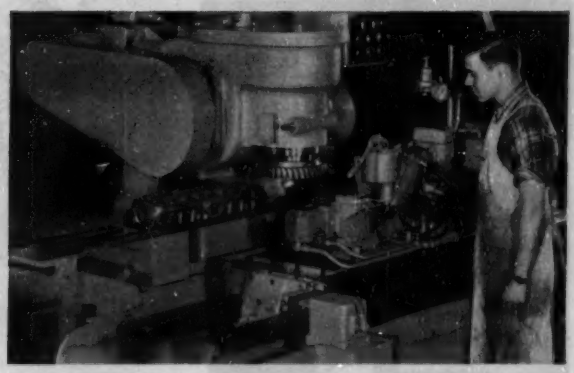






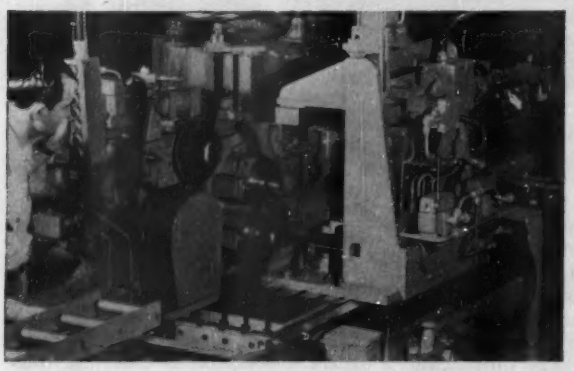
Offset Pads On Bearing Retainers Milled On Rigidmil With Twin Horizontal Spindles

This standard Sundstrand Rigidmil has been provided with two horizontal single spindle heads, one above the other. The two spindles are offset for simultaneously milling a boss and one edge of flange of bearing retainers. A simple, manually operated work holding fixture holds one piece at a time, and an automatic table cycle of rapid approach, feed and rapid return is used to machine the two pads on 60 pieces per hour.



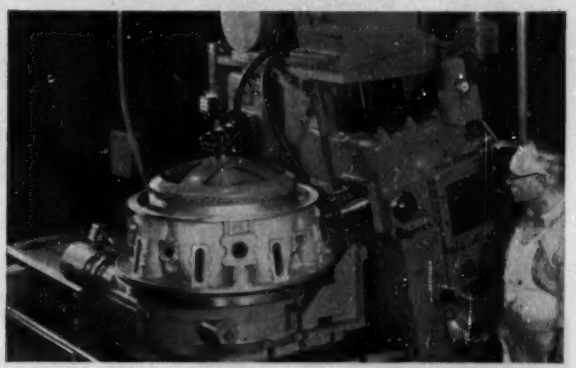
Rigidmil With Vertical and Angular Spindles Mills Combustion Face and Manifold Pad of Cylinder Head

This special head's vertical spindle mills the combustion face and its 25° angular spindle mills the manifold pad. The work is clamped in an air-operated fixture and in automatic cycle is fed at 35 inches per minute past the cutters to remove .015" of stock. At end of feed stroke the fixture automatically unclamps and a hook arrangement pulls the cylinder head out of the fixture as table rapid returns. Production is 60 per hour.



Odd Pads of Cylinder Block Milled On Rigidmil With Special 3 Spindle Head

Here is a standard Rigidmil with a special horizontal three spindle head for face milling two locating bosses and two shoulder bosses on automotive cylinder blocks. The two lower spindles are fixed but upper spindle automatically retracts to clear the rear end of block. The work enters the air-operated fixture from the incoming conveyer, is automatically fed through the cut and advanced clear of the cutters to the outgoing conveyer. Production is 70 blocks per hour.



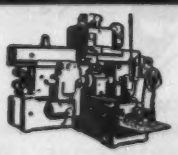
Rigidmil With One Horizontal and One Angular Head Mills 21 Pads on Compressor Frame

This standard Rigidmil has a single column on which a horizontal and a special angular head are mounted. The angular head mills 8 angular pads and the horizontal head mills 13 pads, all presented to the cutters by a special Sundstrand 21 station index base. In addition to the standard vertical feed attachment, the machine has automatic quill setting to control depth of cut and electronically controlled table and head feeds for infinite variation in a range from 2" to 100" per minute.

Write for more proof of the successful application of Sundstrand "Engineered" milling production. This new 40 page book contains over 35 actual problem solutions together with interesting tooling diagrams. Write for your copy today. Ask for Bulletin No. 143.

FREE DATA

TRIPLEX RIGIDMILS | SPECIAL MACHINES



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2533 Eleventh St. • Rockford, Ill., U.S.A.

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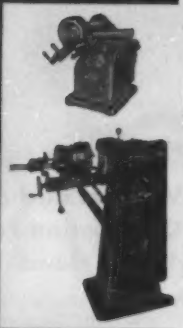
Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to 1/2".

No. 510. For Drills 3/4" to 3"—2-3-4 flute.



OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" —also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 11/2" wide x 13/4" high, from 0° to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten-Carbide and high speed tools—offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

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OLIVER INSTRUMENT CO.

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Write 'Em Right

We have been buying machine tools for our shop since 1922 and, in many cases, we find the instruction manuals furnished with the machines do not correctly describe the machine, nor give proper lubrication instructions. This is a vital matter, especially the lubrication angle, and I'm sure customers would gladly pay a dollar or two for a manual that would apply exactly to the machine.

Sometimes the manuals are ahead of the machine, sometimes behind. Apparently the manufacturers sometimes run out of manuals before they quit making a certain series, so they send out manuals prepared for a later type. In other cases they have manuals left over from an older machine so they send out an old manual with a new machine.

We bought a toolroom grinder new in 1948, and both the manual and the lubrication instruction plate specify that the motor is to be lubricated with SAE 30 oil once a week. The motor furnished, however, is a sealed unit and there are no lubrication fittings. On the other hand, there is a Zerk fitting on the machine that connects with a pump inside the bed, and no mention of this is made.

Another time we bought a new lathe and the manual stated that the cross-slide had forced-feed lubrication. We found that later models did, but ours did not. This is serious and could result in serious damage.

I hope you will publish this letter in the interests of those of us who think manufacturers should, at least, provide adequate lubrication instructions for machine tools.

L E Wilson
Cashmere, Wash

Skeptic

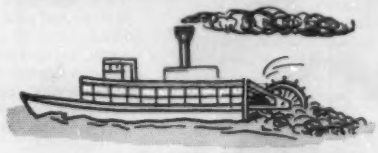
I'm sorry but it just doesn't look kosher to me. If Westinghouse spends $3000 to make a color TV set that retails for $1295, (*AM*—Mar 29 '54 p140) that means that, figuring dealers' and distributors' commissions, they get about $600 for a $3000 item; a loss of $2400 a set. Even at the present production of 22 sets a day, this means a loss of over $13 million a year, and I'm sure Westinghouse stockholders are not going to stand that for very long. Are you sure you didn't get your wires crossed?

Henry Bascomb
Detroit

Quite sure. The information came from Westinghouse, but they don't expect to keep on at that rate, and costs will go down as production goes up.—Ed

GRINETICS

BY D G SMITH



FLUID DRIVE

TENSION REEL

PERMANENT MAGNET

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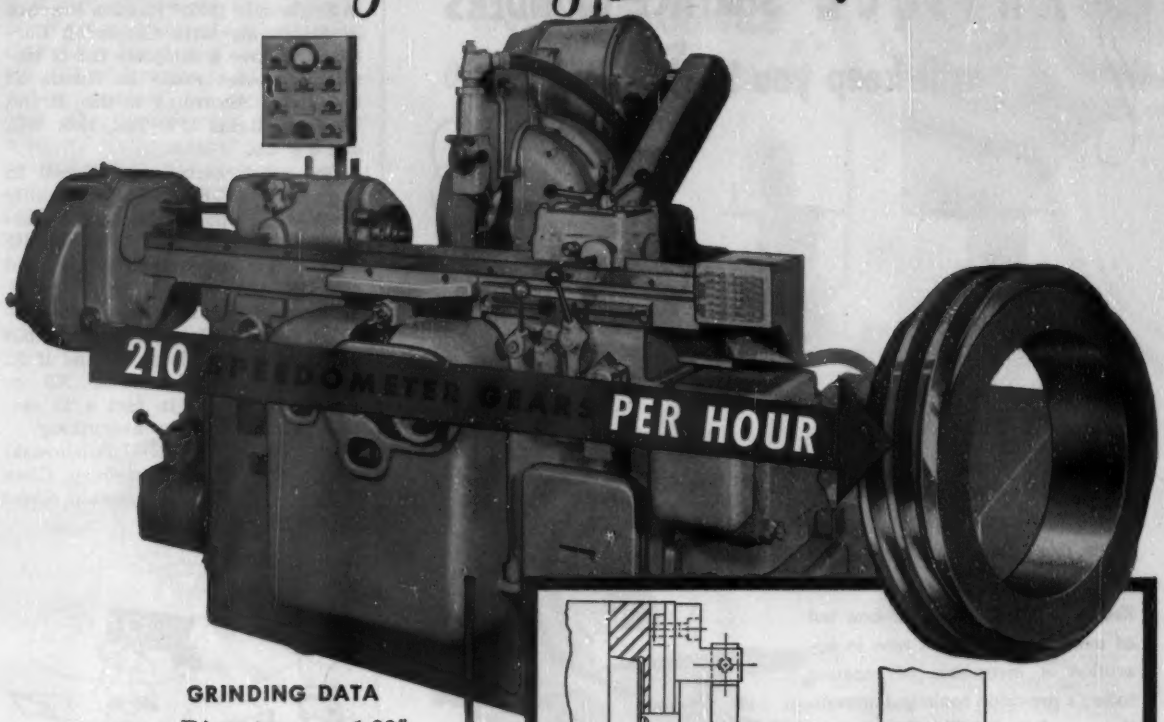
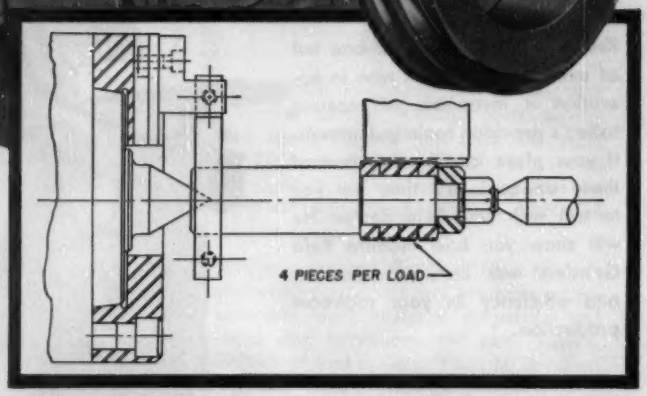
Multi-ribbed grinding BOOSTS production!





GRINDING DATA

Diameter . . . 1.93″
Pitch . . . Approx. 6
Form . . . Worm
Thread . . . 4-Start
Lead . . . .6797″
Helix Angle . . . 6° 37′
Thread Length . . . 1⅞″
One way grinding
Stock removed . . . .089″
Crush Dressing of Wheel

AUTOMATIC WORK CYCLE

Automatic In Feed
Automatic Sizing
Automatic Wheel Trueing
Automatic Lubrication
Automatic Coolant System

These four-start worms are ground — four at a time in a single pass — from the solid. A multi-ribbed wheel is crush-dressed every 48 pieces (twelve arbor loads). The finish on these parts — and the rate of production — exceed those possible by any other methods.

This is a typical example of how the FULLY AUTOMATIC WORK CYCLE of Jones & Lamson Automatic Grinders assures rapid metal removal, accuracy of form and quality of finish.

Because of today's challenge for increased production at a higher degree of accuracy, Automatic thread and Form Grinders are replacing other methods for producing this class of work.

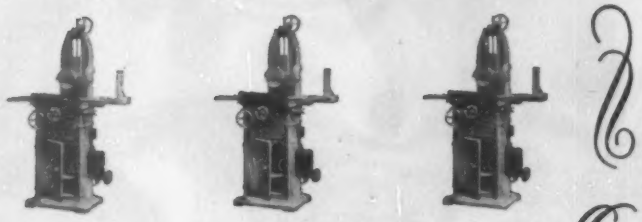
On the basis of increased quality and *more production per labor hour*, we invite the opportunity to improve upon your existing methods.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

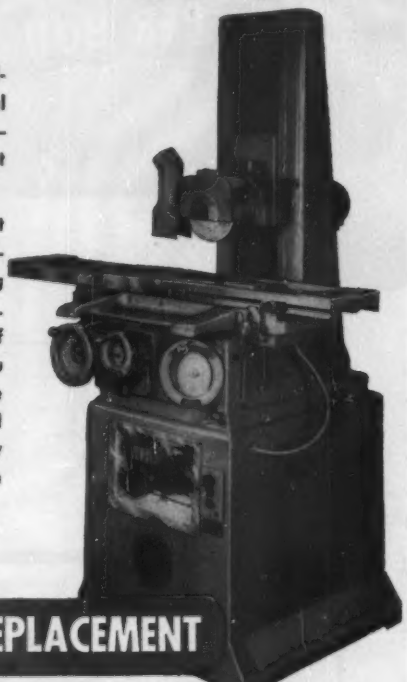
JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L MACHINE TOOL DIV.

ANTIQUE SURFACE GRINDERS will keep you in the RED



Operating over-age surface grinders in your toolroom — the focal point of all quality production — deals a punishing blow to plant costs and efficiency.

Recent surveys show that one out of every five machines now in operation is incapable of meeting today's precision tooling demands. If your plant is still using one of these antiques, it's time for you to talk with your Reid dealer. He will show you how modern Reid Grinders will increase accuracy and efficiency in your toolroom production.



PLAN NOW FOR REPLACEMENT

with REID GRINDERS

For complete information on Reid Surface Grinders, write today for Catalog 618-1.

see our catalog in MACHINE TOOL CATALOGS or write for copy

Model 618V illustrated

Reid Brothers Company, Inc.
Keene, New Hampshire

Solution

Reference is made to the remark on the bottom of the page (*AM*—April 12 '54, p171). In an article printed in England in 1952, "Russian Practice in Machining with Cemented Carbides," I gave a complete list of sintered carbides made in Russia at that time. According to this, Brand T15K6 contains 15% TiC, 79% WC, and 6% Co.

The other carbide mentioned in your article, TK-S2, is presumably made in Czechoslovakia. TK is certainly for titanium carbide, and S2 may be the German wartime symbol of a certain class of their own stuff. I do not have, right now, a composition table of German carbides, but you can check this point, and if S2 (covering Krupp's Widia X8 or Boehler's E88) is in fact a Ti carbide, then you know everything.

N H Polakowski
Waterbury, Conn

Thank you for this extremely useful information.—Ed.

For Spite?

I don't know if you did this just on purpose to annoy me, but it is a strange coincidence that you published my letter in your last issue (*AM*—April 12 '54, p140), and in the very same issue (p170) you published an article about Russian cleverness in inventing a new type of cutting tool.

I haven't tried it yet, so doubt if it is any good, but if it is, I'll bet my last dollar the Russians invented it about as much as they invented radio, television and airplanes. It is more likely that they stole the idea from the Czechs who do, at least, have this in their favor, that they were always good metalworkers.

Robert Seagrave
New York City

It was just a coincidence, but we hold no brief for the Commies. The idea seemed reasonable to us, and you will note that we published it with a big question mark, as well as specifying the source—a Czech paper.—Ed.

Misunderstanding

I am afraid I misunderstood Mr Salmons' letter (*AM*—Nov 23 '53, p100) and thought he meant he would sooner have the title of "vice-president in charge of engine lathes" than get more money and keep the old title of foreman.

After reading his second letter (*AM*—Mar 15 '54, p98) I understand what he really meant, and I hope he will accept my apologies for a rather abrupt reply. May I say that I fully agree with him and not only would do the same thing but have actually done so. A man's happiness in his job, and his self-respect, come far ahead of mere monetary considerations.

J Redding
Houston, Texas

Whose Job?

Look at it from the toolmaker's point of view, Mr Murrer (*AM*—Mar 15 '54, p105). I work for a big company as a toolmaker, and I took the job because it looked like fairly steady work, even though I could have got a few cents more an hour in a smaller contract shop. When we have more work than we can handle, we don't mind seeing the excess farmed out; but when things get slack, why should we be laid off while an outsider is working? It is our company's work and we should have first claim on it.

Anyhow, the Tool & Die Makers Ass'n doesn't have to worry. There are always plenty of specialized jobs that require special machines and skills that a manufacturing plant can't afford to buy. There are enough of these to keep the good tool shops busy, and if the little fly-by-night outfits go to the wall they're no great loss. Too many of them were set up to make a fast buck when the heat was on. Their work just got by because the plant maintenance dept made the corrections and said nothing because of the urgency of the job.

G Staffani
Cleveland

for Special Service on Carbide "Specials"

GORHAM

GORHAM

GORHAM

When your production machining problem dictates the use of special carbide tooling, your nearby Gorham Field Engineer can give you the right answers fast! He's an expert in the design and application of special cutting tools . . . and he provides a complete engineering service to determine your exact requirements.

He begins with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and required finishes and tolerances. He plots speeds, feeds and methods of tool driving. Then he develops practical design and metallurgical specifications for a special tool that's "tailor-made" for your application. And his recommendations are backed by Gorham's more than thirty years' experience in the design, manufacture and heat treatment of fine cutting tools.

Yes, your nearby Gorham Field Engineer is a helpful man to have around! If you haven't yet met him, write for his name, or send details of your problem direct, and we'll have him get in touch with you promptly.

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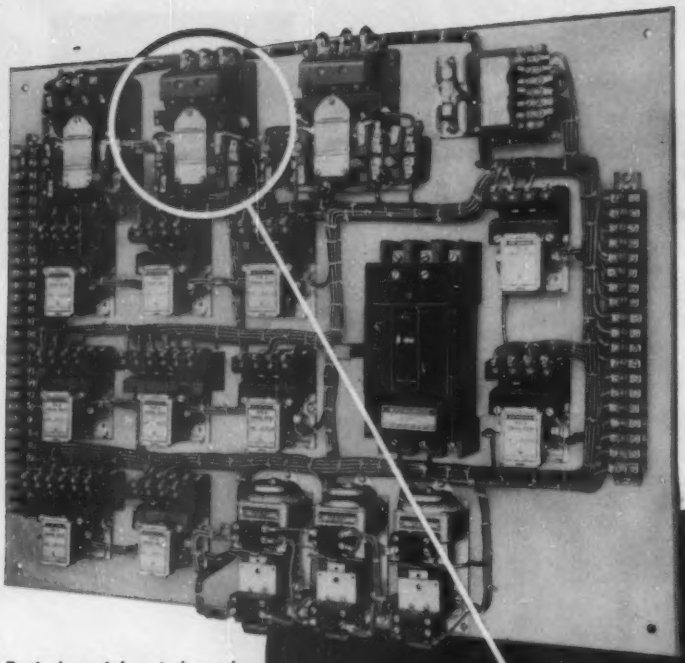
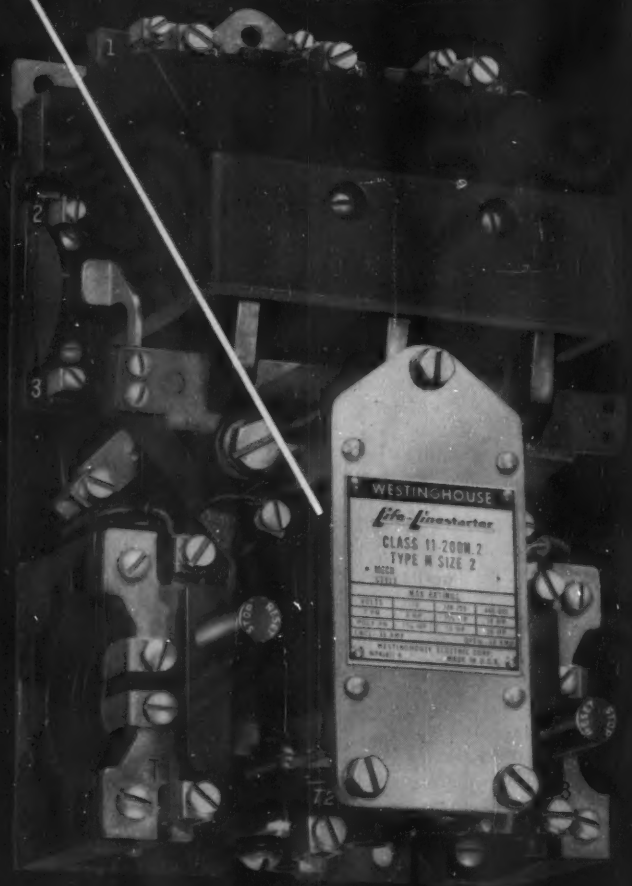


Typical special control panel with all Westinghouse components.

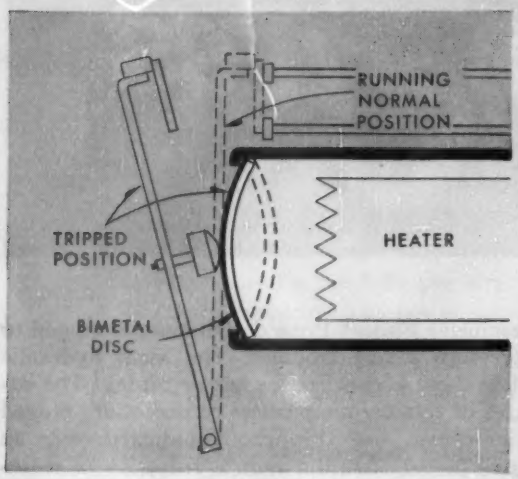
Compare the Westinghouse complete control line for any application



Life-Linestarter NEMA Size 2

Compare...

Snap-action overload relay gives longer, more dependable life in Westinghouse *Life-Line* Starters



Westinghouse bi-metal principle of overload relay protection—reliable, exclusive, unmatched in performance anywhere.

See this flame test. When heated and placed on a flat surface, this bi-metal disc will snap into the air, demonstrating the simple, quick, powerful action that protects your motors. Ask your Westinghouse Representative for a demonstration.

Here are four basic standards of dependability you can always count on with Westinghouse Life-Line Starter overload protection for motors.

1. Longer continuous operation—without maintenance or replacement of the relay or parts. The heart of the relay, and built into every Life-Line, is a simple bi-metal disc, precisely calibrated for life; it will not wear out, even after years of service. That's dependability.

2. Unfailing motor protection—the Westinghouse bi-metal, disc-type relay measures heat exactly, snaps into action at the critical moment, opens contacts instantly before overload can become dangerous, cause motor burnout and reduce valuable equipment to shambles. That's dependability.

3. The relay cannot be destroyed by premature or "hot" resets that ruin and cause replacement after replacement of other types of relays. The Westinghouse bi-metal disc cannot fatigue, age or oxidize. That's dependability.

4. Simplicity of the Westinghouse overload relay—parts that aren't there can't wear. That's dependability.

The bi-metal disc type of overload relay is the most reliable motor protection you can buy—and it's manufactured only by Westinghouse. Build Life-Line Starters, Relays and associated apparatus into your equipment. Provide your customer with all the protection he can get against burned out motors, expensive rewind jobs, unexpected and costly down time, backlogged production.

See your Westinghouse Representative for the rest of the story about the ruggedness and long life designed into all components of Life-Line Starters. Or write for Motor Control Book B-5882, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-30153

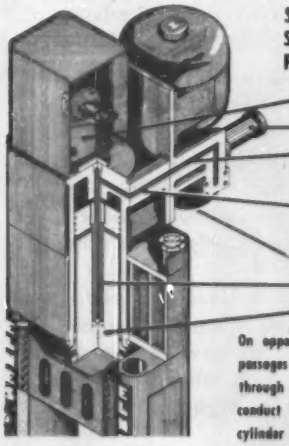
YOU CAN BE SURE...IF IT'S Westinghouse

Remarkably Low-Cost Maintenance Practically No Downtime

With ELMES PIPELESS HYDRAULIC PRESS CONSTRUCTION

HIGH-SPEED "PIPELESS" PRESS with two reversible pumps

450-Ton Elmes Single-Action Metal Drawing & Forming Press, with many special features including the revolutionary Elmes Pipeless construction. This press employs two reversible pumps, providing the following operating speeds per minute: advance—550″, press—126″, return—550″.



SECTIONAL VIEW SHOWING ELMES PIPELESS CONSTRUCTION

- Prefill valve.
- Pump Shifting cylinder.
- Passage through pump bracket for pull-back fluid.
- Passage through cylinder for pull-back fluid.
- Pump.
- Pull-back tube.
- Main Ram.

On opposite side of the press there are passages similar to the passages shown through pump bracket and cylinder, which conduct the pressure fluid to the main cylinder area.

This exclusive Elmes® Press design has put an end to high-pressure piping troubles. The main hydraulic circuit in these Elmes Presses *has no piping!* The advantages of this unique pipeless construction, proved by wide-spread use throughout industry over an extensive period, assure *a radical reduction in maintenance cost, with virtual elimination of downtime.*

In Elmes Pipeless Presses, all high-pressure hydraulic fluid is conducted through short, direct passages drilled in the structural parts. There are no high-pressure screwed joints to loosen, no oil dripping from loosened fittings, no breaking of welded joints. Press operation is smooth, quiet. Reversal of the ram is shockless. Vibration is greatly reduced. Turbulence and oil heating are minimized. Response to electrical controls is prompt and precise.

Any Elmes Metalworking Press, standard or special, can be equipped with pipeless construction—*and at no premium.* Find out now how your production will benefit from the matchless performance of Elmes Pipeless Hydraulic Presses. A formal proposal to suit your particular requirements, or further information, will be promptly supplied on request. Contact your Elmes Distributor or write us direct.

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• Spot News of Metalworking . . .

- **Army Ordnance will mothball machine tools at Fort Custer, Mich,** where 96 block and frame buildings will be given over to storage. This spells finis for Fort Custer as site of the proposed "Air West Point."

- **Better than 25% increase in productivity** at Jones & Lamson Machine Co comes from individual wage incentives applied to both direct and indirect labor. In one case, a machine that originally took 1175 hr to assemble can be done in 370 hr—and the assembly men still manage to earn a 25% bonus.

- **Shot in the arm for shipbuilding;** new Dept of Commerce maritime policy calls for building 60 ships a year beginning next year at an estimated annual cost of $400 million.

- **"Evolutionary" vs "revolutionary" approach** to electronics parts automation has the Air Force favoring the former (single-purpose machines that can handle a variety of work), and the Navy the latter (all-new specially-designed machines). Story on p190.

- **Tax savings of $1 million a year** are anticipated by the screw machine products people when and if the new Excise Tax Bill goes through. Reason: the old tax setup made no distinction between the lubricating oils and cutting oils. Both were subject to the same 6¢-a-gallon tax as the motor oil you put in your car. Now cutting oils will be taxed 10% of sale price.

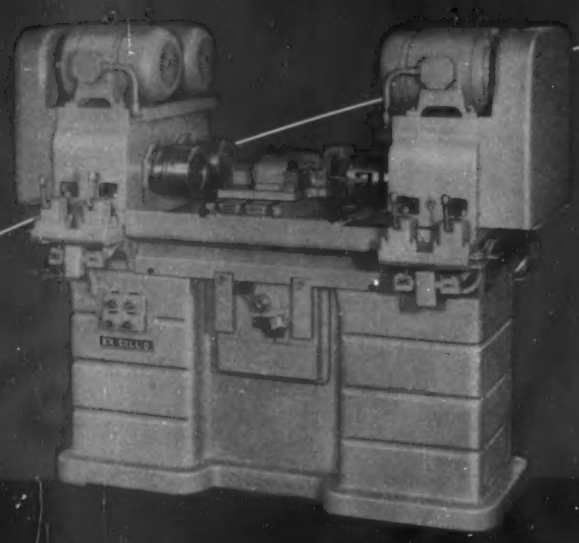
- **Employee-owners of Cleveland Pneumatic Tool Co** did pretty well for themselves financially in their first year as owners. Nearly $2 million was distributed under the profit-sharing plan, plus another $1 million from investments put into their trust fund.

- **Roll-contouring lathe capable of handling 444 in. between centers** has been made by R K LeBlond. It has two 6-way power-traverse carriages—one a tracer—operating from a back templet-carrier bar 35 ft long. Carrier is a weldment supported only at the ends, yet stays flat within 0.004 in. because of its design.

- **A completely automatic foundry** that will produce a casting every 11 seconds is being installed in Cleveland. Automatic production line performs every operation from coremaking to shakeout and delivery.

- **A uranium-fission product is being used** in Armco Steel Corp's new gage that continuously measures the thickness of metallic coatings on a fast-moving steel strip. Beta rays are picked up as they are reflected by the coated steel and recorded in standard units.

- **Look for an auto company to introduce** an auto cooling, heating and ventilating unit for around $200. Lowest-priced unit today is $395.



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EX-CELL-O for PRECISION

STYLE 1212-A. For identical or different operations at each end. When loading time of parts approximates the time of machining, a double-end machine practically doubles production capacity.

You buy Profit Insurance

when you replace obsolete equipment with these MODERN COST-SAVING MACHINES

STYLE 2112-A. Single-end model for workpieces in the small and medium-size range. Flexible hydraulic controls give easy adjustment of multiple operations.

STYLE 112-C. Large and sturdy with long stroke. Accommodates medium and heavy work, gives maximum precision production, minimum operating cost.

STYLE 17. Massive construction. Maintains the highest precision standards on a profitable production basis. Economical in operation, can be set up for variety of jobs.

With this versatile equipment, you can precision bore, turn, face, counterbore, chamfer, and groove.

These machines are standard, yet they'll handle a large variety of precision operations. Ex-Cell-O also has the standard items of tooling to make this possible at minimum cost.

These fast, sturdy, flexible Ex-Cell-O machines are *profit insurance*. For years to come they will keep on turning out *precision work at maximum production speeds.*

EX-CELL-O
Precision
BORING MACHINES

Get all the facts about them from your local Ex-Cell-O representative, or write for a Precision Boring Catalog.

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DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
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54-2

Washington . . .

The House Appropriations Committee killed the $250 million reserve tool fund in the Defense Dept's fiscal 1955 budget. That's practically a death blow for the Vance Plan to build up standby capacity for armaments production by buying long lead-time machine tools way in advance of actual supply contracts. In view of Defense Secretary Wilson's lukewarm support for the program—which was drafted under the Democrats—it's unlikely that the House or the Senate will reinstate the fund in the final budget.

• • •

A new storm may be brewing for the Defense Dept's machine tool program. Rep Ford (R, Mich), who heads an appropriations subcommittee handling the Army budget, has alerted the Pentagon that he's interested in knowing exactly what's in military idle tool inventories and how the equipment is being stored. When the Pentagon was unable to come up with the answers, Rep Ford suggested that teams of industry executives be allowed to take a look at major machine tool storage sites. Most of the inspections have been made, and the teams' reports are now being worked up.

• • •

ODM is just about set to approve leasing of 100 Army machine tools to Ford Motor Co at its Livonia, Mich, plant for two months to produce transmissions for civilian vehicles. Until last fall, the tools were used to make transmissions for T-48 tanks at the same plant.

Ford is now leasing 116 Army tools for similar work —through its subcontractor, Brunswick Ordnance Co, a Mack Truck subsidiary, which is also an Army tank producer. This lease expires next month. On its new lease, Ford may be affected by ODM's plan to boost monthly rental fees on government-owned tools from 1% of acquisition value to 2%.

• • •

Rep Yorty (D, Cal) has introduced a bill to beef up the Small Business Administration. The bill would hike SBA loan limitations from $150,000 to $500,000, and control interest rates charged by private lenders on government-guaranteed loans. Even more, the bill would make SBA a permanent agency (it's now due to go out of existence June 1955) and completely independent of Treasury and Commerce control of its lending policy.

Only six of GSA's 114 machine tool pool-order contracts are still in effect. Shipment of 262 tools worth $16.9 million are due by Sept 1 under their provisions. Of the 93,613 tools valued at $1.2 billion produced under the Market Guarantee Program, 741 worth $10.8 million have been tendered to GSA by 21 pool-order contractors. Practically all of these are covered by "sales and storage" agreements with GSA. This means contractors will maintain the tools for one year, agreeing to sell the equipment in preference to other tools of a like type produced during that time.

• • •

Settlement of the Justice Dept's antitrust suit against last year's highly-publicized Alcoa purchase of primary aluminum from Alcan has two big effects: (1) US aluminum fabricators can count on a minimum supply of 110,000 tons of Canadian metal for each of the next six years; (2) prospects for another round of domestic expansion in aluminum are dimmer than ever.

Federal court order two weeks ago does not cancel Alcoa-Alcan contract, but gives preference to independent fabricators over Alcoa should Alcan be unable to fulfil obligations to both in the future. In addition, Alcoa must offer 25% of its Alcan purchase to Olin Industries, a new competitor in aluminum.

• • •

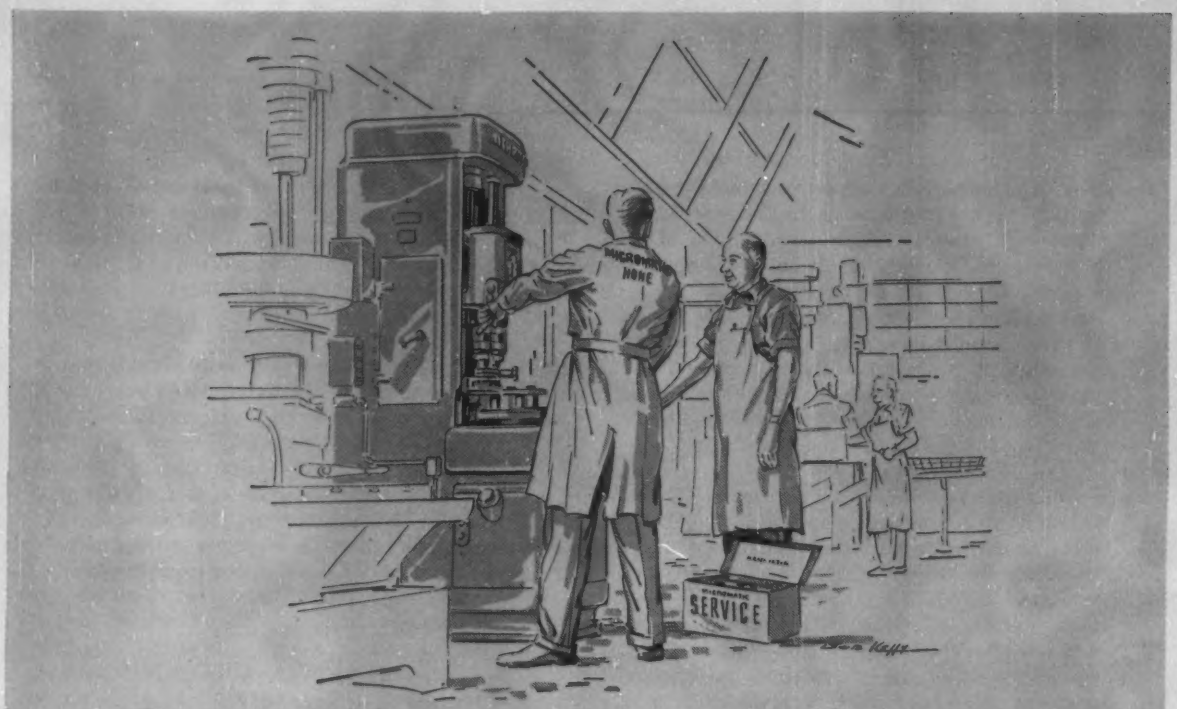
Dealers in used and rebuilt machine tools are putting up a big fight in the Senate to get for their products the same faster tax amortization the new tax bill gives new machinery and equipment. Writing off two-thirds of the cost of a piece of equipment in half the useful life is a key section of the administration's tax program; but the House didn't permit used and rebuilt tools this same benefit.

• • •

Unemployment becomes one of the big political issues beginning in May and June. Administration economists and business economists now see no new upsurge in business before fall. But a continued plateau in the level of business isn't enough. A plateau means a pickup in seasonal employment this summer, but there's no certainty that unemployment will thereby show a decline.

The CIO will lead off the Democratic offensive on May 11. The union is bringing some 300 delegates to Washington to put the spotlight on unemployment and the CIO program for combatting it: tax cuts for the consumer and an extensive public works program.

So far Eisenhower is standing pat on his business-bolstering policies. He's winning out against the Democratic drive for reduction in individual income taxes. He still holds that budget-balancing plus tax aids to business expansion is all that's required at the present time. For the foreseeable future he's strongly against any "slam bang" programs designed to offset unemployment and to give business a shot in the arm. The next few months will tell the tale.



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Detroit . . .

The Nash-Hudson consolidation does not create a "Big Four," but it puts George Mason, first chairman and president of American Motors Corp, in a commanding position if he has in mind eventual formation of an even larger auto combine.

And surely that has been at the top of his thinking during the protracted merger negotiations. Integration likely will permit manufacturing economies, but to cash in on reduced costs, the end product must be sold.

Latest registration figures show Hudson as having sold only a few units over 6000, just half its sales at the same time last year. Nash has sold about 14,000 as against about 32,000 a year ago, slipping from ninth to twelfth place in sales.

Total production of Nash and Hudson together so far this year is about 33,000, as against a combined 106,000 last year.

Mason has said Nash-Hudson dealer organizations will be strengthened. At the same time, he said dual dealerships are not now under consideration. Will Hudson dealers begin selling more of the same cars in May simply because they have become a part of AMC? It's not likely.

AMC probably forms the nucleus around which other small auto makers and perhaps some automotive suppliers can cluster. And somewhere along the line, new management probably will begin winnowing out some of the comparably priced Nash-Hudson models now competing against one another.

Mason noted that the merger was first discussed six years ago, and intensive negotiations began last summer. But on grounds that it is too early to detail a tooling or styling program, he refused to say whether some car models are doomed.

• • •

Development of a process involving substitution of laminated and impregnated mahogany board for the plain mahogany usually used to make wooden models from which steel production dies are formed has been perfected by Ford and the US Forest Products Laboratory.

Mahogany veneer is impregnated with synthetic resins and laminated into board. Swelling, shrinking and moisture absorption are reduced and heat-resistant qualities are increased.

• • •

Projections by Michigan's Employment Security Commission indicate that unemployment in May and June should be down slightly from mid-March's 216,000, but MESC considers that only a seasonal pickup.

By late summer, joblessness in the state is expected to be higher still—up around 250,000. Auto work forces, which represent nearly one-half the total jobs, are expected to drop in July.

These projects are based on established construction, manufacturing, agricultural and other trends. Not figured in: political considerations. Some Detroit industrialists suggest that with a senatorial seat and the governorship up for grabs this fall, important attention will be paid the employment picture by both parties. What possible remedies could be applied to reduce unemployment are not so frequently discussed.

• • •

Ford's former tank plant in Livonia will begin shipping automatic transmissions in July. Production of all parts required for complete transmissions got underway this month.

About 20,000 machine tools and other equipment items formerly used to produce M48 tanks have been placed in storage in a government-owned warehouse adjacent to Ford's 1.5-million-sq-ft plant.

• • •

Ford has passed the 1-million mark in automatic transmission installations. About 40% of all Fords are equipped with Fordomatics, which were introduced three years ago.

• • •

Most modest claim of the month: Buick General Manager Ivan Wiles says there have been but three major engineering and styling changes in cars since WWII.

All three, it develops, are innovations by Buick: Dynaflow drive, hardtop coupe styling and what Wiles calls Buick's "dream car styling" of today. Competitors' changes discounted by Wiles: power steering, power brakes, air conditioning, half-glass tops, such very good transmissions as Powerflite and Ultramatic, etc.

• • •

The Ford-Chevrolet sales and production contest stays as tight as major league standings.

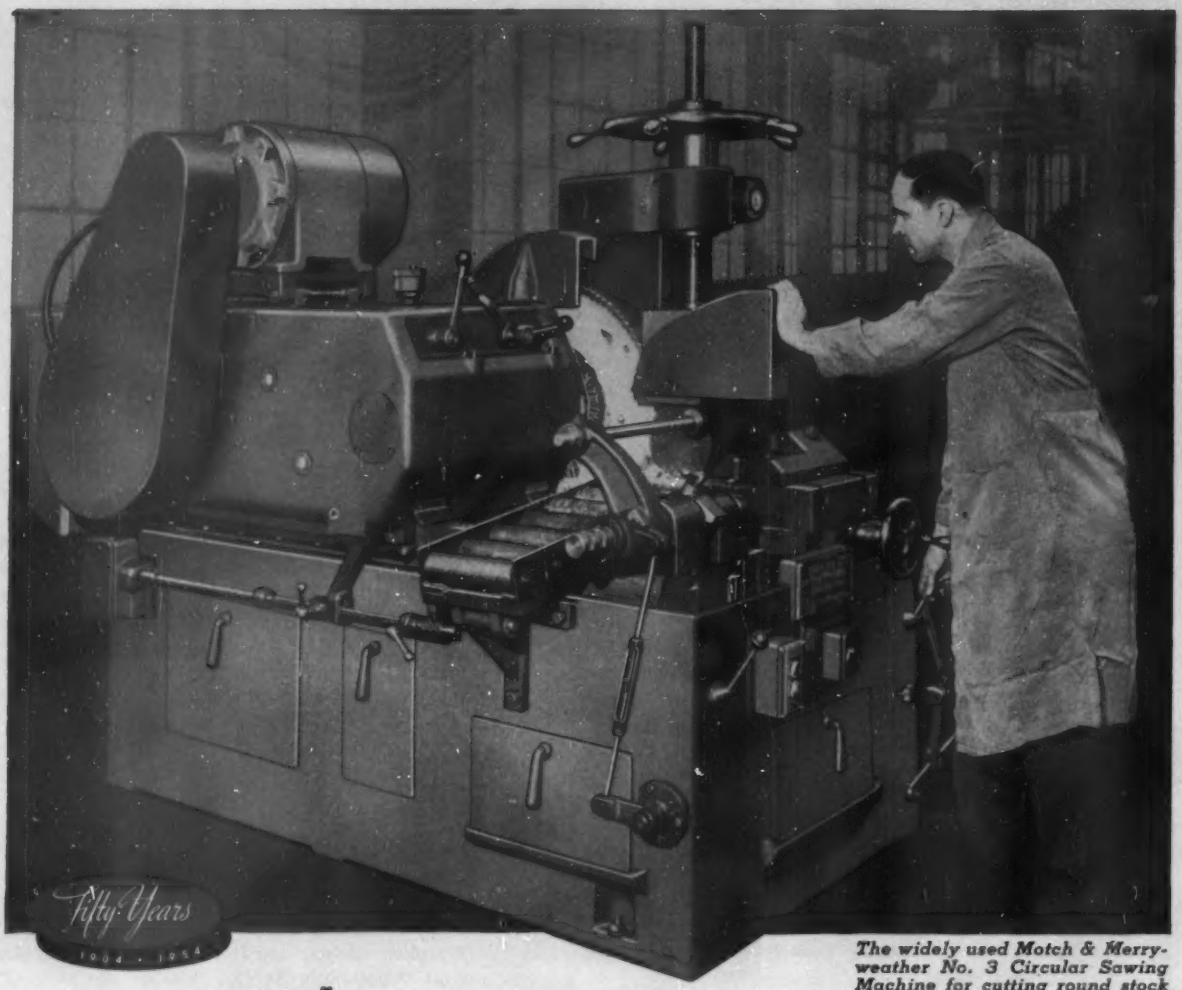
Chevrolet whacked the Ford margin down late in April by assembling a prodigious 34,300 units in one week—more than 4000 above Ford that week.

Through April 24, *"Automotive News"* showed Ford in front of Chevvy for the year by a slim 1000 units. But latest registration figures put Ford ahead in sales by about 3000 units.

T H Keating, Chevrolet's general manager, in one of his infrequent public utterances, suggested that his division may be edging back into first place. April, he said, would be as good or better than any other April record for Chevvy. Total car-truck output, going into May, will be at or near 2.3-million.

• • •

Factory sales of cars, trucks and buses through March totaled 1,718,275, making the three months the third highest first quarter in history.



The widely used Motch & Merryweather No. 3 Circular Sawing Machine for cutting round stock up to 10" diameter.

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Machine Tools . . .

All general-purpose machine tools are to be classed as non-strategic for purposes of trading with Russia and her satellites, London reports say. Red China is excluded from the trading area.

The non-strategic list which embraces all common types of machine tools is said to have been agreed upon by the British and Americans in prolonged sessions in London. Later the conference was transferred to Paris.

• • •

Ralph E Cross, director of the Metalworking Equipment Division of the Business and Defense Services Administration, is back in this country after having been technical consultant to US negotiators in the London and Paris meetings.

The official blessing given to this non-strategic list opens the door for the British to fill the Russian orders that they already have booked. It also opens the door to further orders.

It means too that machine tool builders in all the western nations will be free to take similar business from behind the iron curtain. The United States obviously is included.

• • •

This trading-with-Russia policy promises to precipitate violent reactions in both Britain and this country.

The British, contrary to the impression here, are not of one mind on the subject, not even in their machine tool industry.

One segment of the British industry, typified by Robert Asquith, chairman of William Asquith Ltd, champions the cause. Mr. Asquith is the immediate past president of the British Machine Tool Trades Association. He spent three weeks in Moscow and brought back home $18 million in machine tool orders for Russian delivery.

• • •

Another segment of the British industry, typified by Richard Ryder, managing director of J H Ryder & Sons Ltd and current president of the MTTA, is opposed to such trading with Moscow. A third segment is reported indifferent.

It is impossible to tell exactly what the political reaction may be in this country when and if actual orders for Russian delivery are booked.

In any event, the legal door to such trading is going to be wide open.

• • •

Competition for the highly specialized automotive business is becoming keener in the machine tool industry. More and more builders are designing automated special machines and are setting aside portions of their plants, or are adding facilities, to be devoted exclusively to making "specials."

The House appropriations committee has given the Vance Plan its knockout blow by refusing to include in the 1955 budget the $250 million for elephant tools or any other kind of reserve machines.

Pentagon had the money for use in fiscal 1954 which is rapidly coming to an end. But Secretary of Defense Wilson did not choose to spend it.

When Pentagon asked that the fund be continued in fiscal 1955, the House committee said that "other funds appropriated for procurement purposes can be utilized for these items should the need arise." The Pentagon people say that there are no "other funds."

• • •

Vance Plan supporters have long accused Secretary Wilson and his staff of dragging their feet on the reserve tool program. Mr Wilson has been an ardent champion of the dual-plant idea for defense purposes. It was first introduced in General Motors under his presidency. He has shied away, on the other hand, from the elephant tool plan, though the money has been at hand for months to put the plan into practice.

• • •

Machine tool production in Europe, excluding Russia, is sharply up from prewar days, according to estimates from reliable sources.

Output, in terms of 1948 prices, totaled $125 million a year in 1952 and again in 1953. That compares with $517 million in 1938 and $480 million in 1948.

Estimated annual production in West Germany, also in terms of 1948 prices, is put at $125 million in 1952 and 1953. That is about one-half the country's 1936 production (for what then was a united Germany consisting of East and West Germany).

About three-fifths of Europe's output of machine tools has been produced in the United Kingdom, West Germany and France.

Sharpest gain has been in eastern Europe (not including Russia). Czechoslovakia, Poland and Hungary combined produced $153 million or 20% of the European total 1952-1953 annual production. That compares with $27 million or 5% in 1938.

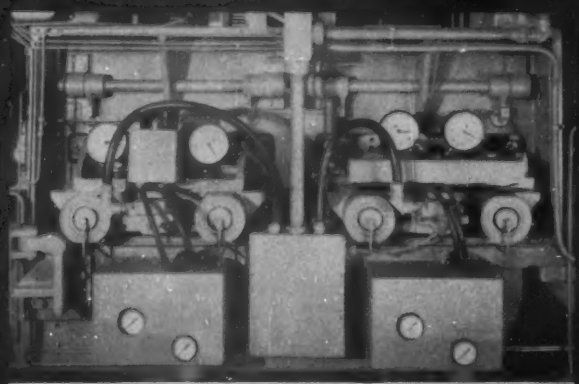
• • •

Senate Finance Committee now has under consideration the federal tax bill, which includes liberalized depreciation for production equipment.

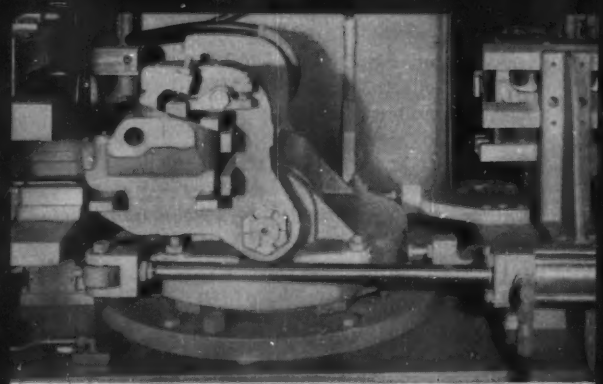
It is a good guess that the depreciation provision will stay in the bill and will be approved by Congress.

BF

NEW NATCO HOLEWAY *machines...*



AIR INSPECTION Stations No. 9, 29 and 30 of the first machine check reamed holes for diameter and location.



90° ROTATE and TURN Station No. 32 of the first machine rotates part 90° around each of two axes simultaneously for proper positioning in second machine.

ALL OPERATIONS COMPLETELY AUTOMATIC!

MACHINE No. 1 (35 Station)

1 Loading	1 90° Rotating
14 Working	2 Interference Relief
4 Checking	10 Idle
2 Chip Dumping	1 Unloading

MACHINE No. 2 (25 Station)

1 Loading	1 90° Rotating
13 Working	3 Idle
3 Checking	1 Ejecting and Replacing
1 Air Testing	1 Unloading

. . . ANOTHER MACHINE

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INSPECTS HOLE DEPTHS,
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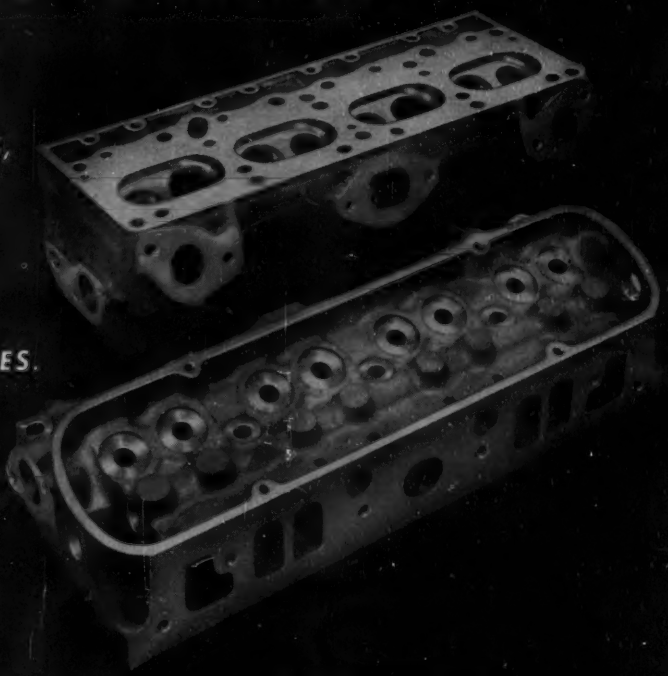
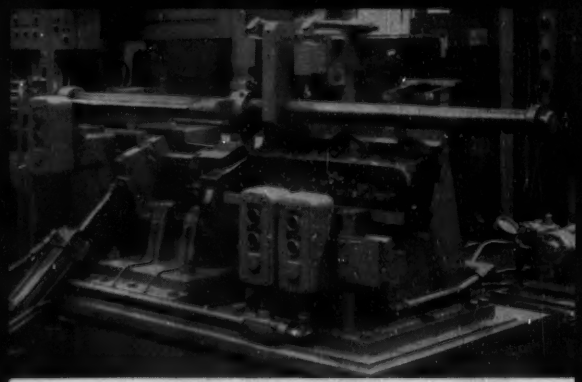
CHECKS OIL GALLERY
HOLE and EJECTS
DEFECTIVE PART and
REPLACES WITH
SALVAGED PART.



REJECTION and REPLACEMENT Station 17 of second machine air checks oil gallery hole, automatically ejects defective part, station 18 automatically replaces with salvaged part.



70° ROTATION Station No. 24 of the second machine rotates part 70° to bring valve hole in horizontal plane.

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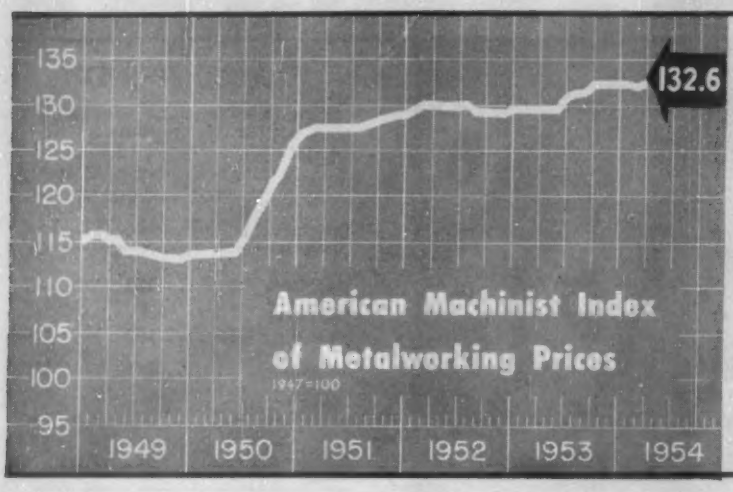
Gaging Business . . .



PRICE INDEX

	APR '54(*)	MAR '54(p)	FEB '54(r)	MAR '53
Total Index	**132.6**	**132.8**	**132.8**	**129.6**
Metalworking Machinery	**142.0**	**142.0**		**137.9**
Other Machinery exc. Electrical	**137.6**	**137.5**		**132.8**
Electrical Machinery	**132.0**	**132.0**		**124.8**
Fabricated Metal Products	**129.0**	**129.1**		**127.6**

(*) Estimated (p) preliminary (r) revised

New construction, a barometer of future business conditions, is running 'way ahead of the 1953 total, and is far out front of predictions.

In fact, construction hung up an all-time record in the first quarter, was $2 billion ahead of official forecast for the year, and over $1 billion above the 1953 total.

While private residential construction held about level with 1953's first quarter, boom in building of commercial structures jumped non-residential building over the comparable period in 1953.

• • •

Overall industrial production was down, but only slightly, in March.

Automotive production in mid-April was down about 7% from mid-April 1953. And steel production, although it is leveling off a bit, continued to be off almost a third from 1953 output.

Railroad carloadings, another business barometer, showed a slight upswing toward mid-April, but were still 18-20% off from 1953.

But there are some pretty bright spots in the picture, too. For example, department store sales for the Easter season showed a healthy gain of almost 12% over 1953 sales.

Appliances accounted for their share of store sales this spring. For instance, factory sales of household vacuum cleaners in March were the highest since March 1953. But even then, sales were 16% less than in March 1953.

• • •

New orders for steel have improved some lately. And markets for non-ferrous metals have firmed up. Even the textile business reports that stocks are close to normal levels.

But "normal" will be lower in all lines if business activity continues to decline.

• • •

Cost of living is inching down. The Index was 114.8% of the 1947-49 average in March—and 0.5% under peak October 1953. And excise tax cuts could bring it down still more.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	121.8	120.9	136.4
Steel ingot production (thousand tons)	1,632	1,636	2,262
Electric power output (million Kilowatt hours)	8,257	8,345	8,016
Production of automobiles and trucks	156,754	148,559	194,610
Engineering construction awards (*Eng. News-Record*—millions)	$241.1	$248.0	$373.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	334	343	378
Vacuum cleaners sales (thousands of units)	199	221	246
Washers sales (thousands of units)	295	250	327
Household electric ranges sales (thousands of units)	110	102	114
Radio production (thousands of units)	769	872	1,192
Television production (thousands of units)	427	421	731
Gear sales index (1947-49 = 100)*	165.1	167.4	188.1
Foundry equipment new orders index (shipments, 1947-49 = 100)*	N.A.	173.8	97.5

* Seasonally adjusted N.A. not available

NEW

Zinc-Coated Tubing Offers Full Rust Protection

Have you avoided using welded steel tubing in your products because you couldn't get the rust protection of a zinc coating? You can now obtain Armco Steel Tubing in ZINCGRIP, the special zinc-coated steel that gives unbroken rust protection.

GIVES FULL PROTECTION

Armco ZINCGRIP Tubing is made from flat ZINCGRIP strip by the electric resistance welding process. Before emerging from the pipe machine, the welding flash is planed from the tube and the zinc coating is replaced on the outside by a special metallizing process. The location of the welded and recoated seam can be found only by careful inspection—it's that smooth.

HOW SUPPLIED

Armco ZINCGRIP Tubing is supplied not only in rounds, but in squares, rectangular shapes, hexagons, octagons and special shapes, all with unbroken zinc coatings. That's because the special hot-dip zinc coating on ZINCGRIP takes as severe forming as the steel base. It does not flake or peel.

Rounds are produced in outside diameters from $\frac{5}{8}$-inch through 3 inches and in wall thicknesses of 20 gage through 12 gage, depending on size. For further information call the nearest Armco District Office or write us at the address below.

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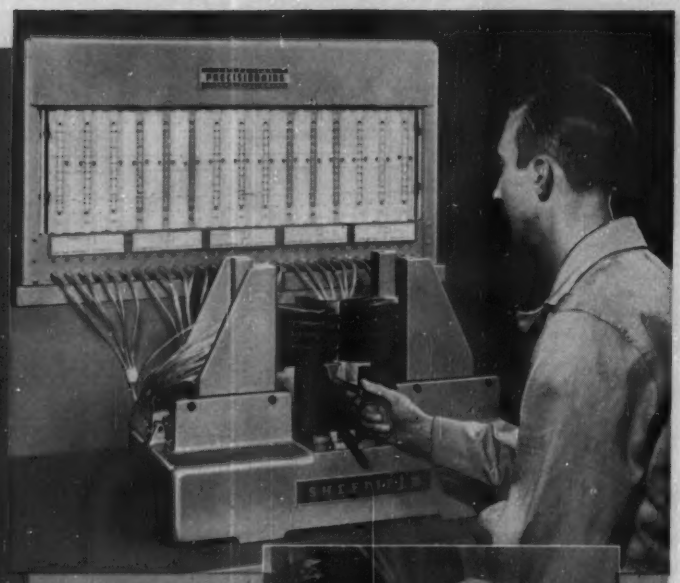
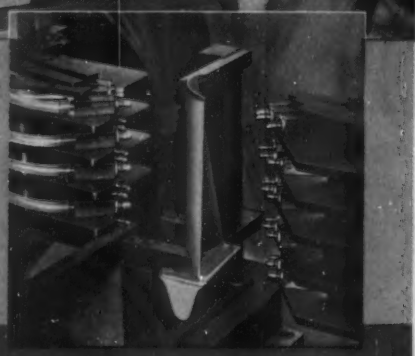


Checking 30 points on a jet engine blade



Gaging heads ready to approach the jet engine blade

Spectacular developments in AIR gaging are saving industry millions of dollars and thousands of man-hours. Here's how and why:

1. One operator with one gage can check up to 40 or more dimensions of each work part simultaneously and instantly. The number of parts per hour depends solely on how fast the inspector can handle them.

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3. The position of each float shows just where the dimension is within tolerance limits or just how much above or below limit if it is out of tolerance. This is essential for Quality Control.

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6757

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Note From Moscow

THE RUSSIANS are fascinated by the possibilities of mechanization of their metalworking industries.

They are working tirelessly to industrialize their vast country as rapidly as possible. And in doing so, they have no inhibitions about the power of the machine.

This is the word carried back home by recent western visitors to Moscow, who have seen Soviet plants in operation. It is confirmed by printed data, including photographs of shop work, that have been allowed to find their way from behind the iron curtain.

The men in charge of Russian manufacture have shown considerable ingenuity. In the early 1940's the USSR is reported to have set up a Ministry devoted solely to machine-tool development and application. Part of that program was said to have been establishment of a central machine-tool design and development department staffed by some 3000 people.

Published information indicates the Soviet's keen interest in "compound machine tools" built on the unit-construction principle. Russian engineers also have gone to work on transfer-type machines as a logical sequence of their deep concern with automation.

The Russians are not content to confine automatic production to plants equipped with highly special equipment. They are applying the principle of automaticity, at least experimentally, to shops containing general-purpose machine tools linked together by an ingenious automation system. Automation, in other words, is being extended to production of a range of similar parts in varying sizes and numbers.

Behind the Soviet thinking is the philosophy that machines with skill built into them should be used at a maximum. Conversely, as few skilled workers as possible should be employed. The result would be the highest possible production of standardized goods in the shortest possible time.

This philosophy, widely applied, is reported to be the only hope the Russians have for putting consumer goods into the hands of scores of millions of workers and thus raising their standard of living. Interestingly enough, it also is the nearest to being a foolproof technique for turning out huge quantities of military goods, if that objective seems desirable.

The point for us is clear. For many years the Kremlin has recognized that America's world leadership and strength lie fundamentally in an industrial economy not seriously challenged anywhere else.

This economy of ours has developed the mass-production technique which has been tested successfully in war and peace. Our ability to keep mechanizing more and more and thus raising constantly our productivity is the source of our unmatched economic power.

The Russians have sensed this fundamental fact from the beginning and have acted accordingly. They would like nothing better than to challenge our industrial supremacy. They are hard at it to do so.

In this effort they are willing to pull out all the stops. Tradition means nothing; innovation is welcomed.

What's going on in the industrialization of Russia should be a warning and a stimulant to us. On the basis of national security alone, we cannot afford to sit on our laurels. Our strength as a nation rests in our keeping the gap between the Soviet and us as wide as possible.

That means, in turn, constant development of new materials, new techniques, and the courage to carry them out. We must stay out in front in mechanization.

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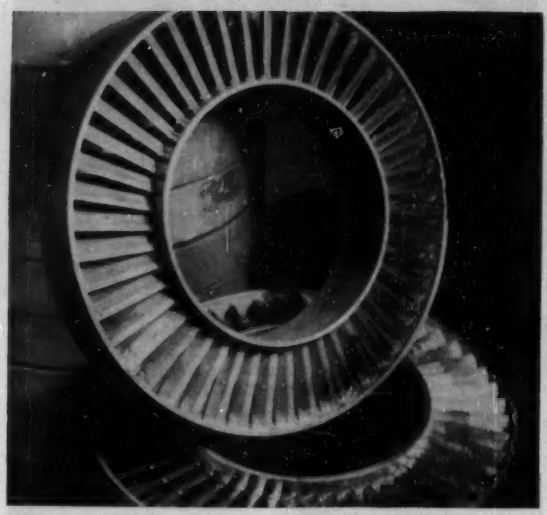


ROTOR (above) has 41 blades, stator (right) has 47. Curves are acute, and blades are packed closely together, leaving little space between for convenient hand work

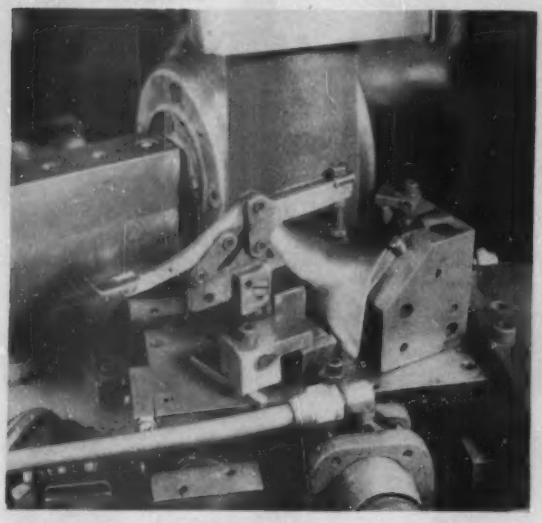
Silver Brazing goes semi-automatic

C P SPIESZ, chief engineer; F G LEUTHNER, project engineer, SAWYER BAILEY CORP, BUFFALO, N Y

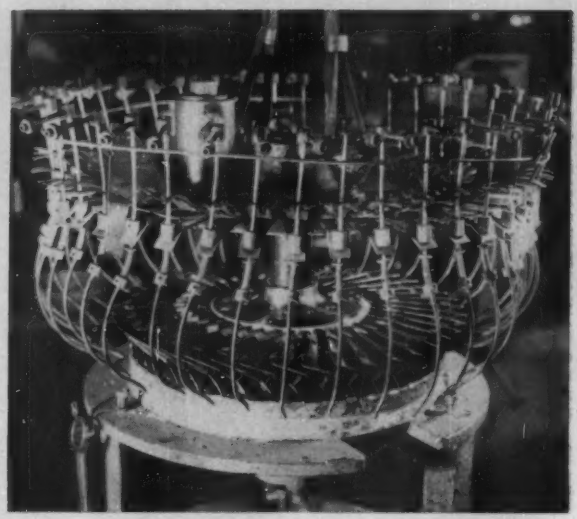
Many a traditional hand process has been cast aside on the path leading toward automation; one of the latest is silver brazing. Hand-held torch and brazing rod have been superseded by a setup that brazes up air-fan rotors and stators automatically once the work is clamped

One trouble with this job when it was done by hand was lack of uniformity in the brazed joints. No matter how skilled the operator, slight differences in distribution of brazing metal caused unbalance in the fan assembly, and slight variations in heat application produced blade distortion. Both of these defects showed up in the stress checks when the fans were run at 20% over the maximum rotational speed, producing a pull of 1500 lb on each blade.

Another trouble was with the speed of assembly. It took 1.3 man-hr per rotor or stator. It was a large-quantity order, and skilled operators were difficult to find or train. There was too much material waste, too. A rotor consumed 8 oz of silver brazing alloy, while a stator required 10 oz; 6 on the outer ring and 4 on the inner. A skilled operator could cut down on the use of metal,



ABRASIVE-BELT MACHINE GRINDS BLADE ROOTS accurately to shape. Fixture with quick-acting clamp locates blade in proper position against idler wheel formed to shape of hub



FINGER CAGE IS SPRING-LOADED to grip blades firmly, yet give slightly as blades settle against hub when braze metal melts and flows

ROTOR ASSEMBLY ON BASEPLATE uses pins for spacing, but small clips actually hold distance between blade faces

but he couldn't reduce the time required for the work.

The natural result of these conditions was an investigation of the product aimed at correcting, simplifying, and speeding up the process.

ROTATION PRODUCES UNIFORMITY

Silver brazing was admittedly the best method of joining the blades to the hubs and rings, so the first step was rig a mechanism for rotating the work during brazing to even out heat and metal distribution. The blades had to be held in place while rotating, and expansion of the metal parts could not be eliminated; so the spring-loaded holding fingers and blade clips were devised. These gripped the blades against the fan hubs, but floated as the hubs and blades expanded.

But the fingers permitted some shifting of the faying (matching) surfaces during the brazing cycle. Joint strength depends on clearance between the surfaces to be joined, and more than 0.008-in. clearance here would weaken the joints too much for the braze quality desired. Because a semi-automatic setup would not permit the operator to correct for minor machining errors found on the blades, they had to be machined to a higher accuracy than before.

Furthermore, it was found that if the blades were machined and aligned closely to the complex curve on the hub, the loss of assemblies at the stress check would be reduced to under 2%.

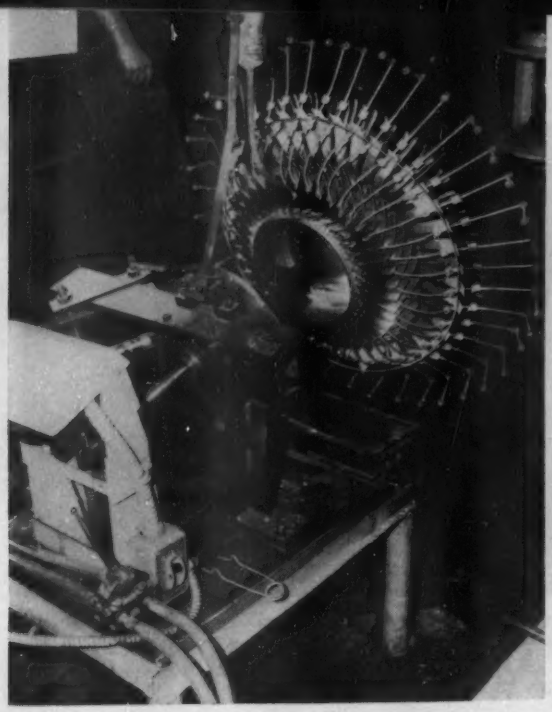
BLADE MACHINING

Milling was tried, but the formed cutter edges failed and their impact on the blade roots caused distortions. Grinding worked better, but wheel wear reduced accuracy and form dressing proved expensive. Finally a belt sander was tried with good results.

The belt runs over a wheel formed to the contours of the hub, and its accuracy is maintained by replacements frequent enough to guarantee uniformity. Heat is kept to a minimum by the way the blades are fed to the belt, which preserves blade strength and reduces deformations at the stress check.

FIXTURING

An index plate was made for the braze fixture. It has a central mandrel over which the fan hub slips, and a ring of dowel pins that locate the blades by their leading and trailing edges. The distance between blades is held by small clips that are added,



WELDING POSITIONER SUPPORTS AND ROTATES fan assembly at 2 rpm. Torch tubes are fed in under spindle to get well inside hub

one to a blade, as the fixture is loaded. These can be pulled out of the fan assembly after brazing.

A cage of spring-loaded hold-down fingers is lowered and closed over the assembly and clamped to the hub. This places one finger against each blade, holding it in position against the hub.

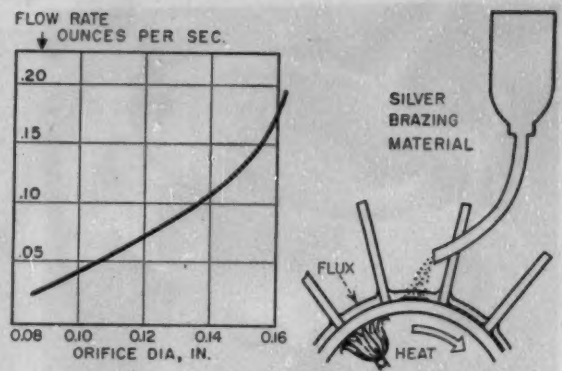
APPLYING THE BRAZE

Neither the hub nor blades are permanently fastened to the baseplate, so the cage and assembly can be lifted off the baseplate and mounted on a welding stand where they are rotated at 2 rpm. To minimize carbonization of the solder and flux, and to keep down direct heat on the blades, the torch nozzles are located inside the hub and the gas flames hit the surface of the hub.

Up to this point, no particular trouble was encountered with the mechanism. The first method of applying silver braze was to pinch and hook wire around the blade roots. This had three disadvantages that caused its abandonment; the blades shifted position, the braze metal dropped away from the joint as it heated, and the whole process took too much time.

Next a thin sheet of braze silver was laid on the hub under the blades, but this didn't work too well, either. Heat caused the sheets to buckle and the blades to shift, and preparation of the sheets took too long.

The third try didn't work too well, but it was close to the right method. The hub was coated with flux, and powdered silver-brazing material was sifted onto it; also the two were mixed together and applied with brush. However, the moisture in the flux steamed out, separating the material from the hub which caused it to drip away from the joints.

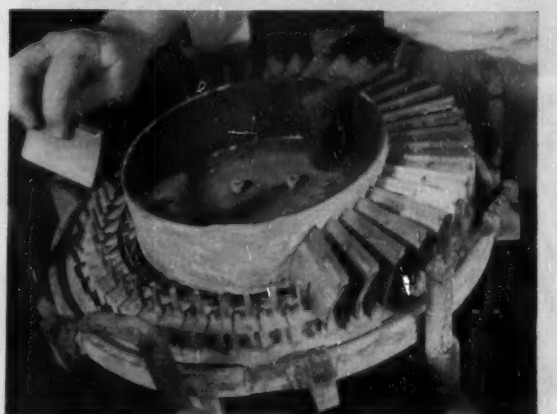


FEED HOPPER drops predetermined amount of braze powder during two revolutions of fan. Heat penetrates through hub sufficiently to cause melting, but doesn't burn. Hopper-orifice size was determined experimentally, producing this curve. Now orifice may be changed if setup requires different speed

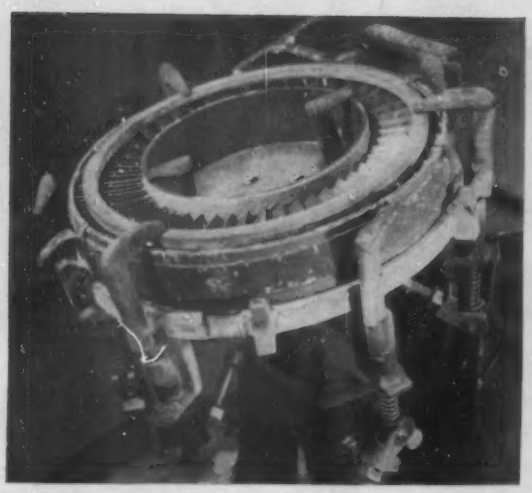
How the New Stacks Up Against the Old

FACTOR	HAND	MACHINE	SAVING
Rotor time, man-hrs	1.30	0.52	60%
Braze material, oz of silver	8	2.6	68%
Actual brazing time, hrs	1.3	0.12	91%

STATOR BLADES have spotwelded boundary-layer plates attached to leading edges. Extra width aids in blade alignment

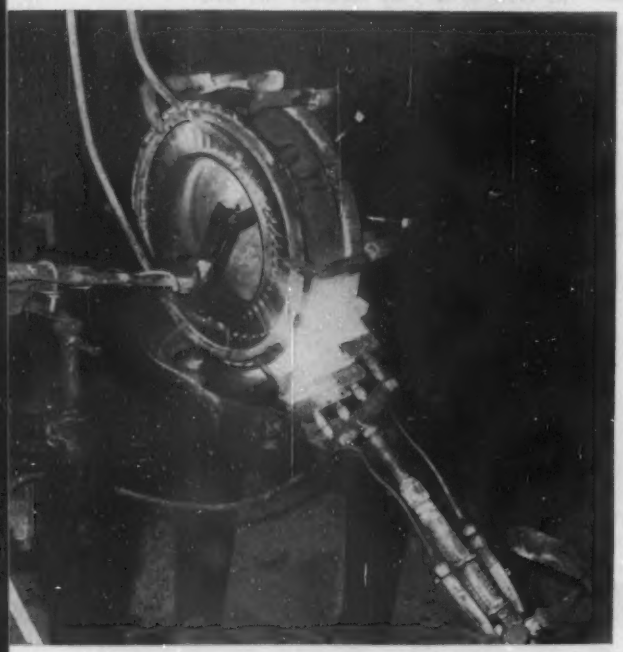


STATOR-BLADE SETUP on baseplate is similar to rig for rotor. Flux has already been painted on hub here



OUTER RING IS ADDED to assembly in fixture. Quick-acting clamps grip retainer ring on top, holding blades down on base

OUTER RING is added as an open loop; it is welded to make circle of right size to grip blades



STATOR BRAZING is done with assembly axis horizontal. Hoppers are high enough to let gravity spray the braze powder, providing good dispersion

Eventually the right combination of pure viscous flux (painted on the hub), blade clips (redesigned to support the blades closer to their centers of gravity), nozzle location, and tilt angle applied to the assembly were worked out.

The braze metal is applied by letting it gravity feed from a hopper through a tube onto the hub. The 40-mesh silver powder clings to the fluxed hub, and is fed through the tube at a rate that produces the right coat after two revolutions of the assembly. It drops through the flux and flows into the joints as it heats, making uniform joints of high strength and good appearance.

HOPPER DESIGN

It was found that particular attention had to be paid to the feed mechanism for the powdered braze metal, because the rate of feed had to be even and the material had to build up to the proper level in just the right amount of time.

Experimentation established the angles on the sides of the hopper—40° from the vertical. A tighter angle jammed the material, and a wider angle did not let the material clear out completely. The inside surfaces of the hopper had to be polished, and the orifice at the bottom of the hopper had to be determined to produce just the flow rate required.

STATOR ASSEMBLY

The stator included a similar set of blades, but with the addition of spotwelded boundary-layer plates attached to the leading edges of the blades. Because the outer ring holds the blades firmly, clips are not required, nor are fingers.

A baseplate with locating pins is loaded with a hub, the blades; then the cuter ring is set in place and welded. The assembly is tilted on the welding positioner and brazing is done as with the rotor. Two sets of nozzles heat the braze material fed through tubes; one on the outside of the outer ring, the other inside the hub as on the rotor.

The new method allows brazing about 60 rotors a day with two machines and at an overall saving of 60% in man-hr and 68% in silver-braze material.

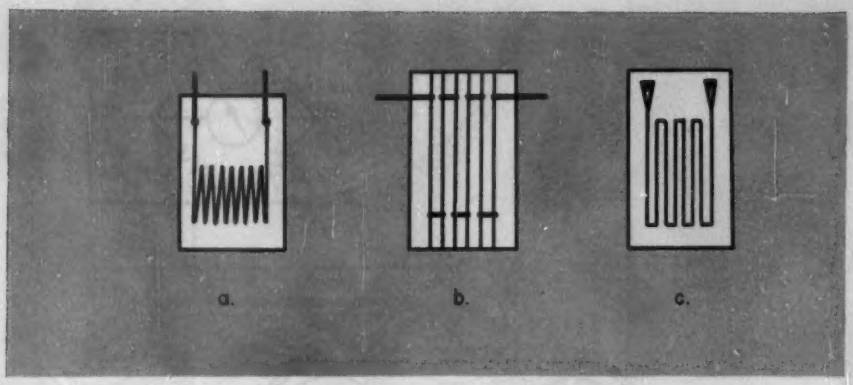


FIG. 1 . . Types of bonded wire-resistance strain gages: (a) American, (b) European plastic type with heavy cross bars, (c) English type etched from solid plate using printed protective film

Machine-tool dynamometers...

a current appraisal

Recent developments make earlier dynamometers obsolete.

Here is a review of principles and types being developed

N H COOK, E G LOEWEN, M C SHAW,

Department of Mechanical Engineering, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The idea of measuring forces on cutting tools occurred to investigators of cutting processes more than half a century ago. Devices they used were relatively crude, but so were machine tools of that time. Since then, many engineers have tackled the problem of building precision dynamometers of high stiffness; some of the methods have been summarized[1].

Schlesinger[2] was probably the first to apply cutting-force data to the design of machine-tool members. However, the main application of tool dynamometers still involves the study of the mechanics of chip formation, tool friction and its reduction by use of cutting fluids and metallurgical changes, as well as improvements associated with changes in tool geometry, tool materials and workpiece structure.

Description of specific dynamometer applications is not the purpose of this article; rather it is intended to discuss dynamometer design and present a few examples of units that have proved satisfactory. A previous paper[3] has described some of the earlier dynamometers developed in the Machine Tool Laboratory at MIT, but in light of more recent advances presented here, these must be considered obsolete.

REQUIREMENTS SEVERE

Design requirements for tool dynamometers are unusually severe. Maximum stiffness is essential to avoid interfering with normal operation of the cutting tool, and this makes it difficult to measure small forces unless very sensitive measuring elements are employed. Usually two or more perpendicular force components are to be measured simultaneously, and it is most troublesome if they interfere with each other (ie, if a vertical force gives an apparent horizontal force reading). Furthermore, sliding surfaces should be avoided because they always introduce unknown amounts of friction. Presence of cutting fluids makes water-proofing very desirable. The most difficult requirement of all, seldom fully accomplished, is to make the dynamometer foolproof.

One feature all dynamometers have in common is measuring springs whose deflections are proportional to the forces. However, the springs can take on many different forms. The major difference between the many proposed dynamometer designs lies in the means used to measure spring deflection. Many familiar devices come to mind. Hydraulic cylinders with pressure gages were used earlier but abandoned as too troublesome. The dial indicator is simple and

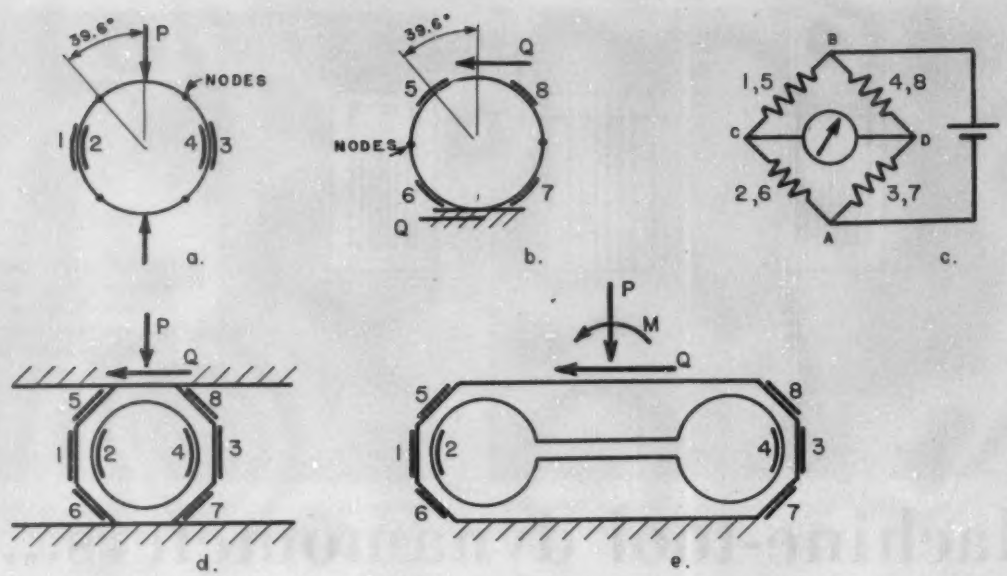
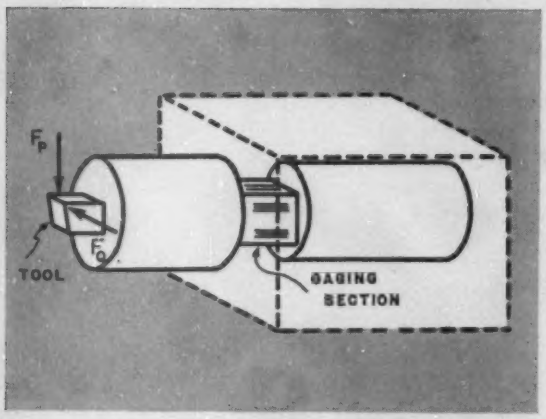
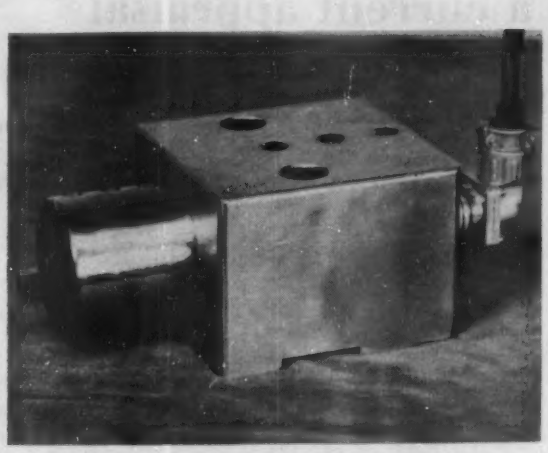


FIG. 2 . . . Evolution of the dynamometer ring as a measuring element





THE TWO-DIMENSIONAL LATHE DYNAMOMETER hardly needs explanation. The gaging section is simply a cantilever beam. Range: 2 to 2000 lb. Stiffness: 500,000 lb/in. This dynamometer uses tool shanks ⅝ in. square

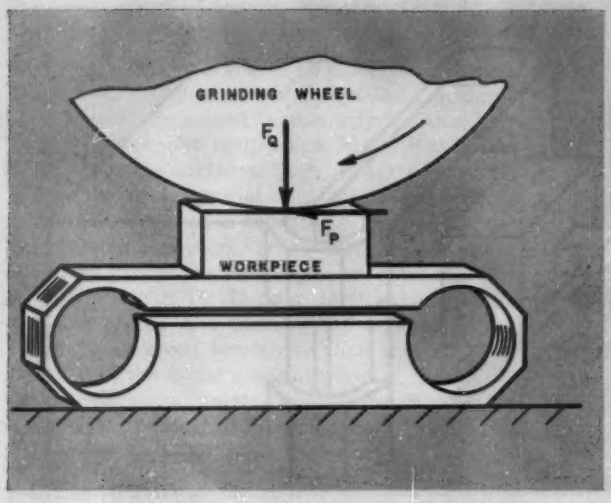
has often been used, but suffers from the fact that it gives a visual reading only. Its more sophisticated brothers, the air gage and the variable-reluctance gage, have proved useful and can sometimes be used with recording devices, a great help to an operator who would rather watch the tool than a row of dials.

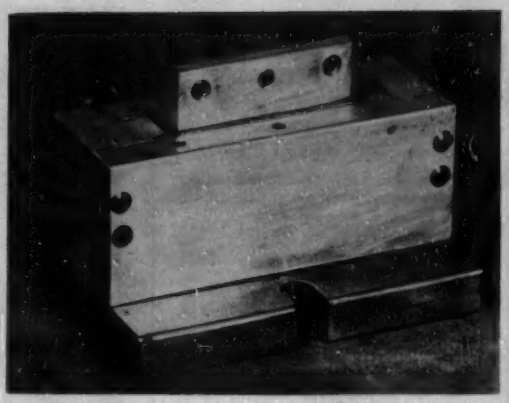
However, now that high-quality amplifying and recording equipment is readily available, commercially bonded electric strain gages probably present the best available measuring device. They possess a unique advantage in that they can be cemented directly to the measuring spring, thus eliminating the need for separate pickup devices.

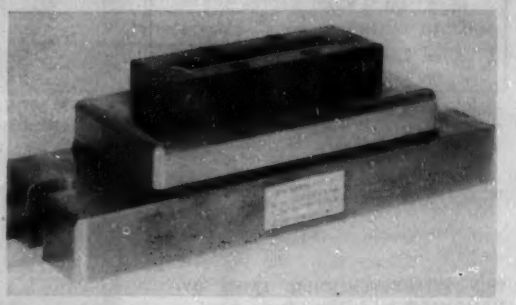
These strain gages consist of very fine parallel wires imbedded in paper or plastic. If they are properly cemented to a metal surface, the wires stretch and compress exactly with the tensile or compressive strains of this surface because they are too fine to resist the motion. This in turn causes an increase or decrease of electrical resistance of the wire that can readily be measured.

Three general types of strain gages are now in use, Figs 1a, b, c. Fig 1a shows the paper-type gage most commonly used in this country; 1b shows a plastic gage which has its several longitudinal strands connected by heavier cross bars. This type was developed and is widely used in Europe. The newest type of gage is of English origin (Fig. 1c) and is made by etching the form of the gage on a thin metal film, the material constituting the wires being protected from acid by printing a protective diagram on the film. This type of gage is not yet made in sizes small enough for use in dynamometers.

Although actual resistance changes in a strain



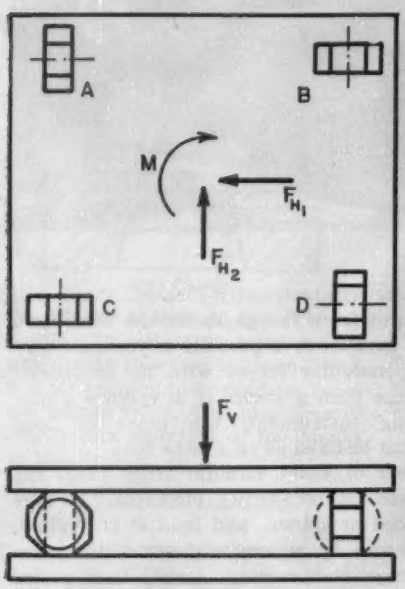


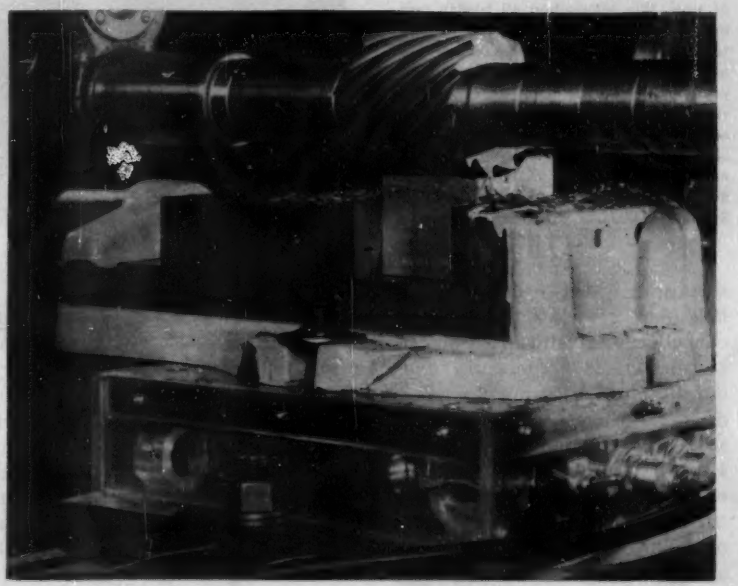


A TWO-DIMENSIONAL GRINDING DYNAMOMETER for use on a surface or belt grinder (left top). The measuring element is simply an extended octagonal ring, measurements being independent of position of load application. A two-dimensional milling, planing, or shaping dynamometer is also shown (right), constructed on the same principle.

Grinding Dynamometer
Range: 0.1 to 100 lb
Stiffness: 4000 lb/in.

Milling dynamometer
Range: 2 to 2000 lb
Stiffness: 1,000,000 lb/in.





THE FOUR-DIMENSIONAL DYNAMOMETER for milling, planing, shaping or tapping studies utilizes four octagonal rings as measuring elements. The dynamometer measures the 3 force components. F_{H1} is measured by rings *B* and *C*; F_{H2} by rings *A* and *D*; F_V by all four rings (8 active gages); and the moment about the vertical axis *M* by rings *A* and *B* wired to subtract. In this manner the four measurements are independent of each other and are independent of the position of load application. Range: 5 to 5000 lb. Stiffness: 25 to 25,000 lb/in.

gage are very small, they are readily measured by connecting the gages in the form of a Wheatstone bridge, as shown in Fig. 2c. Voltage input is across terminals *A* and *B*, and output voltage across *CD* is amplified and recorded. Without going into details, it should be noted that increases in the resistance of opposite arms of the bridge (ie, *CB* and *AD*) and decreases in the other two arms all combine to increase output voltage. At the same time, equal changes in adjacent arms (ie, *CB* and *DB*) produce

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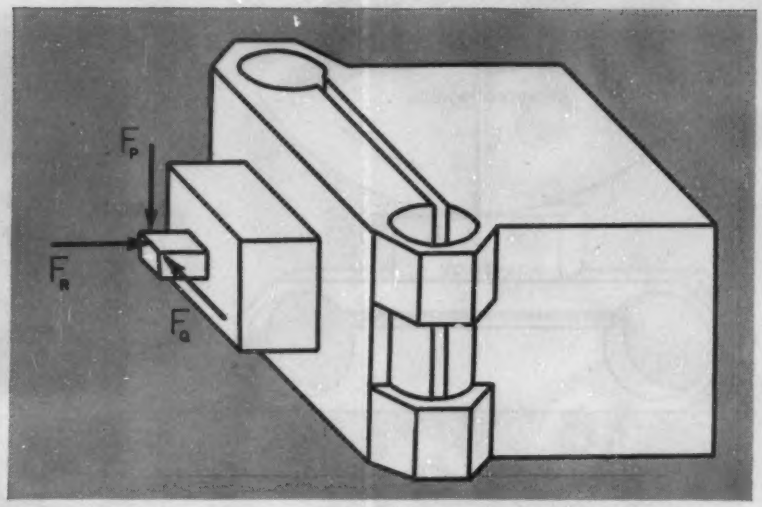
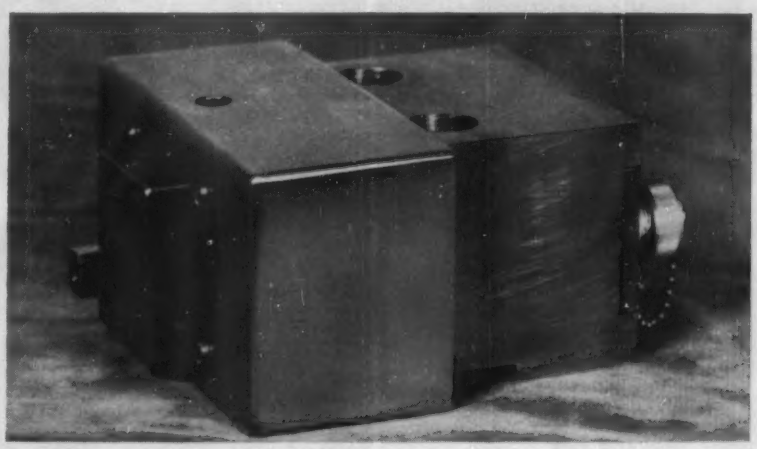
[1] Schnittkraft-und Drehmonentmesser fur Werkzeugmaschinen, by H Schallbroch and H Balzer, Springer, 1954.

[2] Das Versuchsfeld fur Werkzeugmaschinen an der Technischen Hochschule u Berlin, by G Schlesinger, Zeit der VDI, Vol 56, 1912, p 857/862.

[3] Electric Strain Gage Tool Dynamometers, by E G Loewen, E R Marshall, M C Shaw, Proc Am Soc Exp Stress Analysis, Vol 8, No. 2, 1951, p 1-16.





THIS THREE-DIMENSIONAL LATHE DYNAMOMETER is machined from one piece of steel, thus eliminating all friction and bolting effects. Basically, it is two extended octagonal rings, one above the other. F_R puts all four elements in compression, F_Q subjects them all to a sidewise force, while F_P puts the upper elements in tension and the lower ones in compression. Thus, the three forces have no cross-sensitivity.
Range: 4 to 2000 lb
Stiffness: 5,000,000 lb/in.

no output voltage. This property of the Wheatstone bridge is very useful because it allows electrical cancellation of unwanted outputs, such as those resulting from temperature changes, while desired outputs may be summed when it is advantageous to do so. The usual instrumentation allows strains as small as 1 microinch/inch to be measured, although 1/10 of this amount may be detected with special equipment. Maximum output can safely be taken as 1000 microinch/in. This means that a force range of the order of 1000 to 1 can be readily covered with a single dynamometer.

For these reasons, most dynamometers constructed at MIT employ strain gages as measuring elements. In this manner, the spring and the measuring element are combined into one unit. Perhaps the simplest application of strain-gage techniques involves a cantilever beam of square or rectangular cross-section with two gages cemented to each face of the beam with gaging wires parallel to the beam axis. A load applied perpendicular to one face of the beam will put the two gages on that face in tension, and the two on the opposite face in compression, thus giving four active gages for the Wheatstone bridge. If the gages are symmetrically located, there will be no net output from the gages on the other two faces. In this manner it is possible to measure two mutually perpendicular forces with no cross-sensitivity. Because such a device is in essence a moment-measuring instrument, the point of load application must be fixed as on a lathe tool.

For a number of years, circular rings (Fig. 2a) have been used as measuring elements. If four gages are placed as shown, and load P is applied, gages 1 and 3 undergo a tensile strain while gages 2 and 4 undergo compression, giving four active arms (Fig. 2c). This device was used in a number of our early dynamometers.

An elastic investigation of the circular ring shows that when P is applied, there are four points on the ring which are not strained, ie, there are four strain nodes (located 39.6° from P). Such an investigation also reveals that if the top of the ring is restrained from rotating relative to the base, the points that are nodes when P is applied will be strained when a horizontal load Q is applied (Fig. 2b). Also the points where gages 1, 2, 3, and 4 were placed are nodes when Q is applied. As shown in Fig. 2b, gages

5 and 7 will be in tension while 6 and 8 are in compression. Thus, if loads P and Q act simultaneously, they can be measured with no cross-interference by connecting gages into two independent bridges.

The round ring used in this way has one important weakness. No matter how firmly it is bolted to the supporting surfaces, there is a tendency for it to roll when tangential force Q is applied. As a result the horizontal deflections are too large for satisfactory operation. This difficulty can be eliminated by machining the ring to an octagonal shape, as shown in Fig. 1d. Besides providing good bolting surfaces at top and bottom, the octagonal ring is stiffer for a given sensitivity than the round ring, because of the stress concentration at the points of gage application. In this case, gages 5, 6, 7 and 8 are placed at 45° from P, rather than the theoretical value of 39.6°. If the gages are symmetrically placed, this results in no cross-sensitivity. The octagonal ring can be extended as shown in Fig. 2e, thus providing a complete one-piece gaging element. It is apparent that if the position of gages 3 and 4 are reversed in the Wheatstone bridge, the element of Fig. 2e will measure moment M rather than force P.

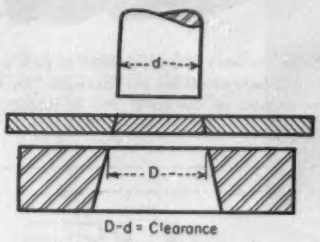
The aforementioned gaging elements have been employed in a number of metal-cutting dynamometers which have proved satisfactory. The versatility of rings as elements is demonstrated by the fact that of the MIT dynamometers, the most sensitive measures to a fraction of 1/100 lb, while the largest can measure up to 10,000 pounds.

Shown here are four representative dynamometers, with their functions and characteristics briefly listed. The range of sensitivity listed is for the particular instrument shown and assumes instrumentation sufficiently sensitive to measure the output of a 4-active-arm bridge when the strain is 10^{-6} in./in.

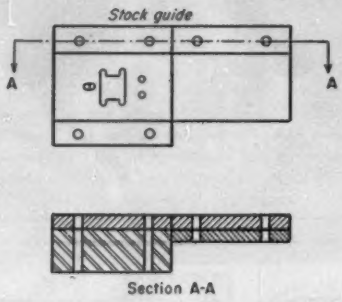
These dynamometers are representative of those in use in the Machine Tool Laboratory at MIT. It is hoped that their description here will be of value to those who have a need for the quantitative evaluation of any cutting practice.

Diemakers' Kinks...

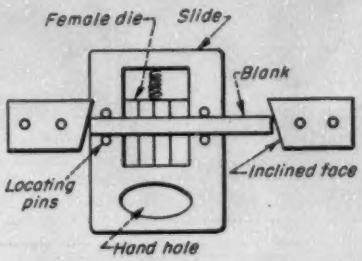
FEDERICO STRASSER



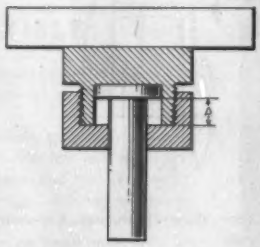
TO RETURN BLANKS to the strip, as required in certain progressive dies, increase the clearance between punch and die opening to as much as twice the normal value. This practice will enable easy insertion of the blanks in the strip.



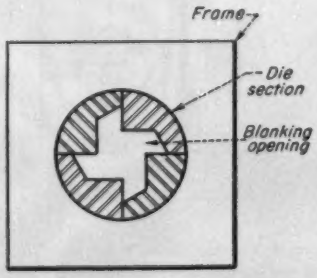
STRIP FEEDING to a progressive die is simplified by extending the rear stock guide and riveting or screwing to it a metal support plate.



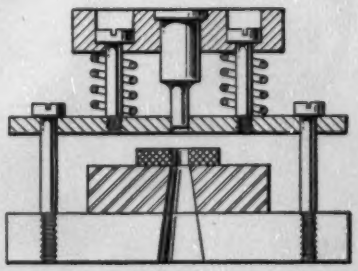
SHEARED BLANKS that are to be bent with two equal legs can be centered in the die in this fashion: The blank is placed on the slide, as shown, and pushed so that the blank strikes blocks with inclined faces. These blocks center the blank over the die.



PUNCH-HOLDER couplings produce the effect of a reduced stroke in a fixed-stroke press. Vertical movement of the punch is equal to the ram stroke minus distance A, the punch movement in the coupling.



SECTIONAL DIES can often be made with identical sections. If this is done, machining, grinding, lapping, and locating the sections are simplified, and replacement of a broken or chipped section is made easier.



WHEN STRIPPING pressures are high, and the stripper springs are not able to strip the scrap skeleton or workpiece, as with heavy stock, add two or four bolts. These will limit the upward travel of the stripper plate.

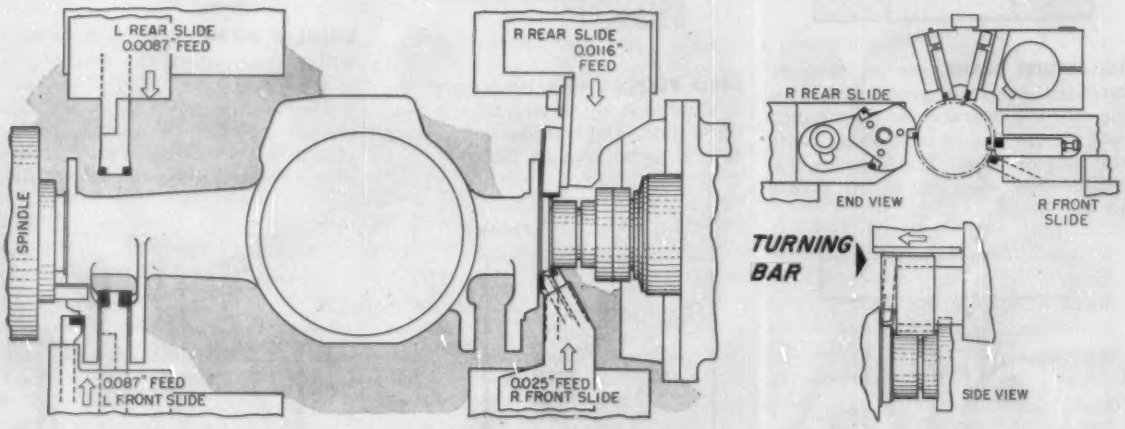
Turnabout tooling cuts time on banjo

SPECIAL MACHINES or complex tooling are not always the answer to a tough machining problem—sometimes a standard machine can do the job. This is a case in point. A banjo-type drive-axle housing for a lift truck had been turned in two operations and locating pads milled in a third—the latter involving heavy intermittent cuts in which ¼ to ⅝ in. of steel had to be removed. There were three sizes of housing. The project was to have one machine do the job.

Tooling was worked out on the basis that housing ends were identical and distances between surfaces machined on tie-bar pads and housing ends were also identical. A standard Gisholt Simplimatic automatic lathe with an extended bed and extra-large platen table was selected. The work was to be held on mandrels at the spindle and tailstock ends. Four standard tool slides (two heavy-duty types), and a cam-operated turning bar on the tailstock carry all tool blocks and tools. Setup, tooling, and sequence of operations are pictured.

Thus a standard machine, with basic tooling for each size of workpiece, meets all requirements. It cuts handling, setup, and downtime; combines all operations on one machine for a more-uniform finished product.

HERE IS THE JOB . . . a banjo-type drive-axle housing for lift trucks, one of three sizes being shown here. Flange must be faced, hub and pilot diameters turned and chamfered at right end of piece while tie-bar pads are rough- and finish-faced at left end. Surfaces to be machined at both ends and the distances between them are identical. This size housing is shown also on our cover and in subsequent photos

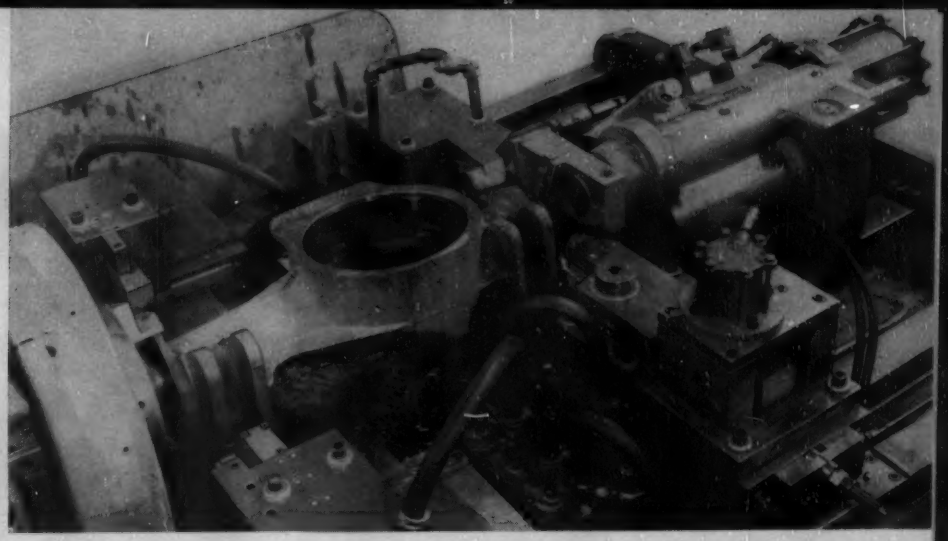


HERE'S HOW IT'S DONE . . . This tooling layout covers the first phase. When it's done, the piece is turned end-for-end and the operation repeated. Here is the sequence of operations:

1. Chuck piece on expanding mandrels and begin automatic cycle
2. Automatic cycle
   a. Left front slide—Face side of tie-bar pad closest to housing end and rough-face between the two pads at this same end
   b. Left rear slide—Finish-face between these two pads
   c. Right front slide—Face flange, chamfer pilot and hub diameters. A circular cutter rough-turns hub diameter at the same time
   d. Tailstock—Cam-operated turning bar carries two tools which move in to size hub and pilot diameters
3. Re-chuck piece, turned end-for-end

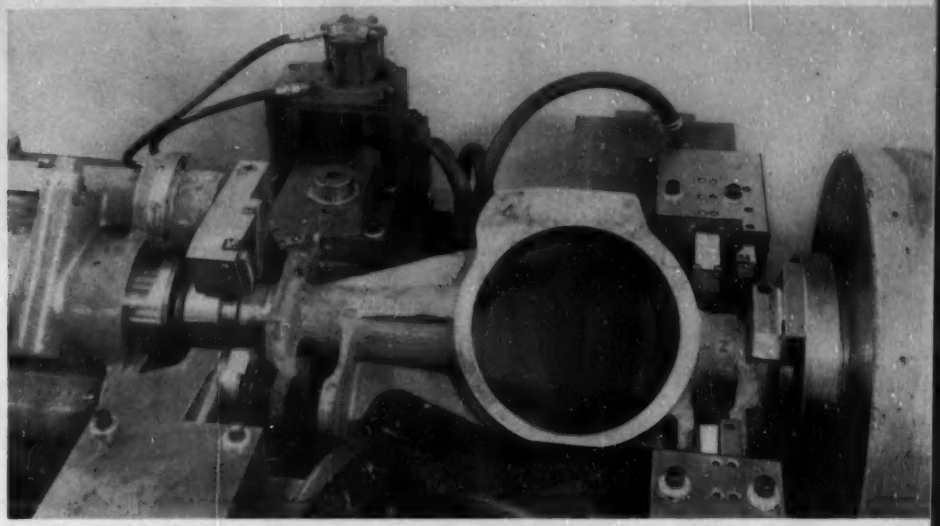
HERE IS THE SETUP

. . . with work in place. A standard Simplimatic has a flat platen table upon which slides, tailstock and tooling may be mounted to suit a wide variety of jobs. This setup, with changed tooling, handles three sizes of parts



SECOND PHASE

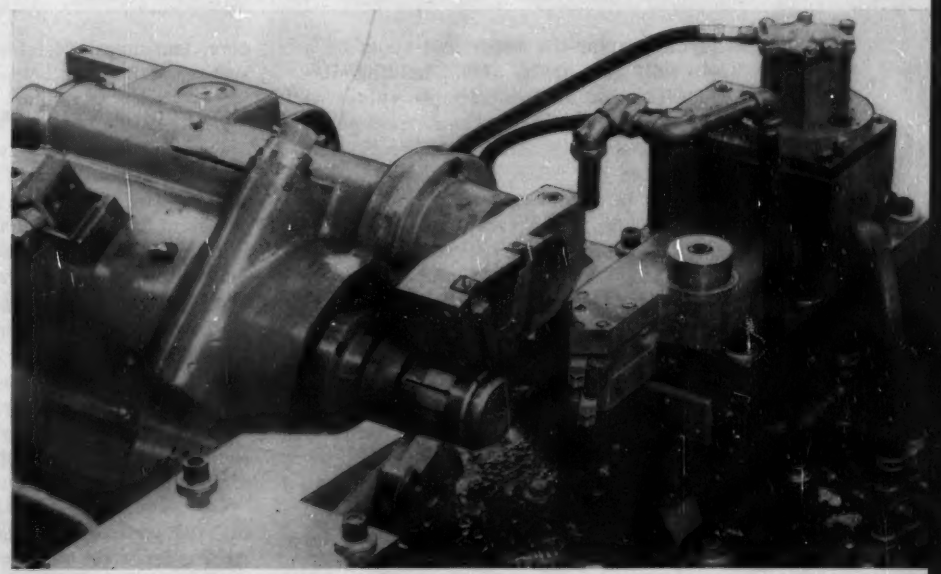
. . . Piece has now been turned end for end. Work done is identical with that on opposite end in first phase. Floor-to-floor time is 15.5 minutes

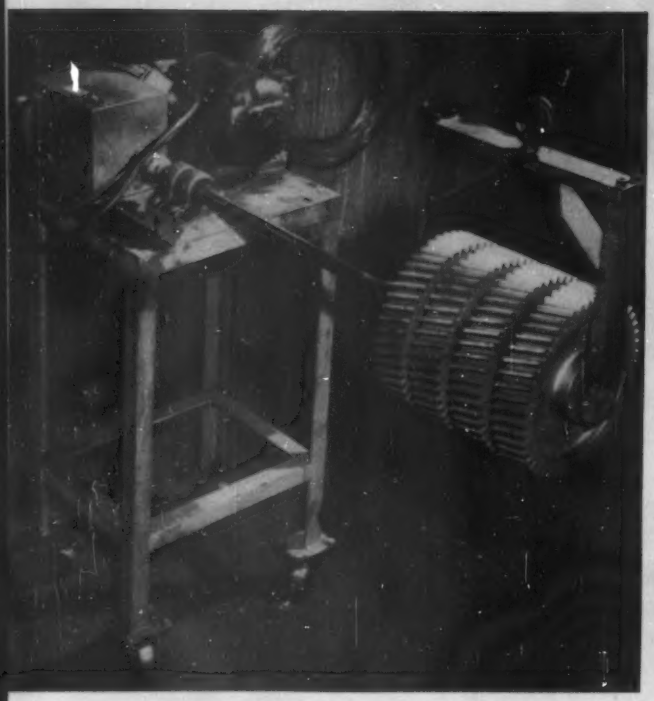


TOOLING IS FLEXIBLE

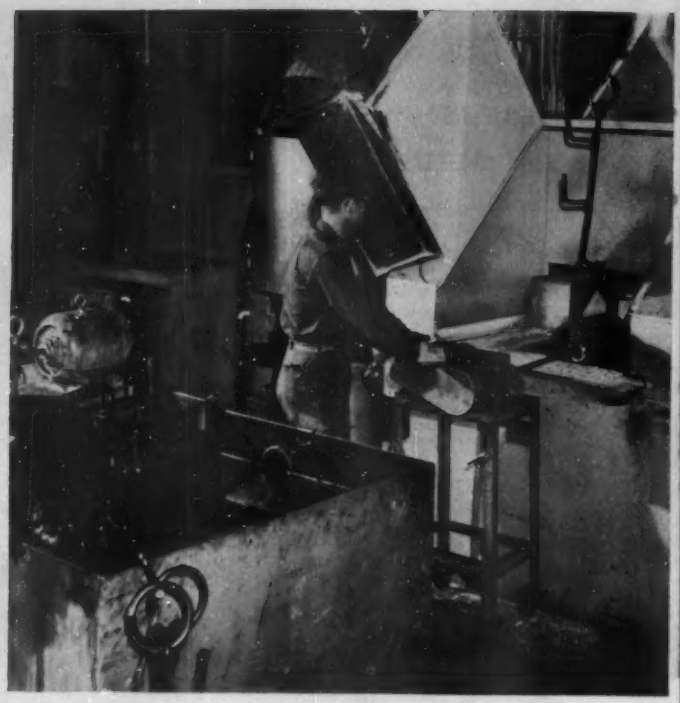
. . . Changeover from one size to another consists of four steps:

1. Relocate tool blocks on front and rear left tool slides and change one tool in each
2. Change circular cutter on right rear slide
3. Change head and tools on tailstock-mounted turning bar
4. Change expanding mandrels on spindle and tailstock. Feeds, speeds, slide movements, and slide and tailstock settings are the same for all three sizes





GEARS ARE FASTENED to the fixture shaft, which is rotated by a variable-speed drive



WORK IS LOWERED into Ajax salt bath, then spun by the driving device

Just spin them

Selective hardening in a salt bath needs only a simple motorized fixture, is fast, and minimizes gear distortion

How would you harden the teeth and roots of a 50-tooth 32-lb bull gear to R_c 57-59, holding distortion and decarburization to negligible values so that machining is not required after heat-treatment? We had this problem with AISI 8620 gears that transmit power from the main drive motor to the drive spindle on our large multiple-spindle machines. The gears require high wear resistance and load-carrying capacity. Hence, we must double quench the gears to produce a refined case and core.

After experimenting with various materials and conventional hardening methods, we tried using a salt bath and a variable-speed-drive arrangement for selective hardening the teeth. This technique has proved so successful that we can harden more than 8,000 lb of gears per day by this method when production warrants.

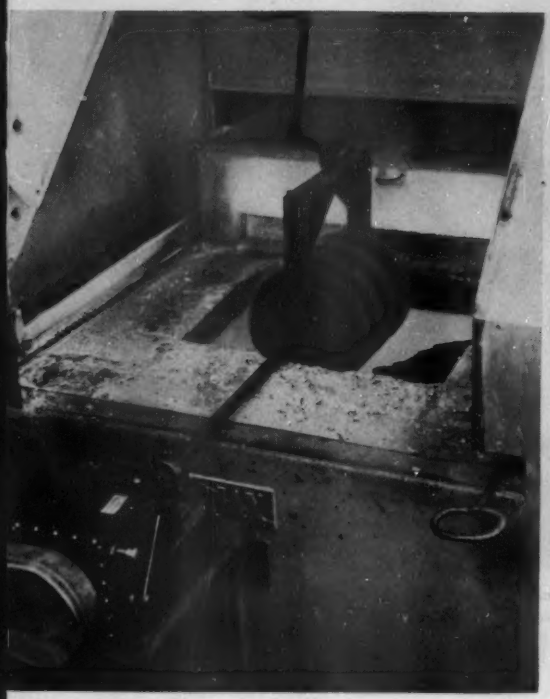
Metallurgical requirements for the bull gears are: 0.040-0.050 in. case depth with 0.90% carbon; core hardness of R_c 28-34; case hardness of teeth and roots, 57-59 R_c; grain refinement of both case and core, and no appreciable distortion, decarburization scaling or burning.

DISTORTION A MAJOR PROBLEM

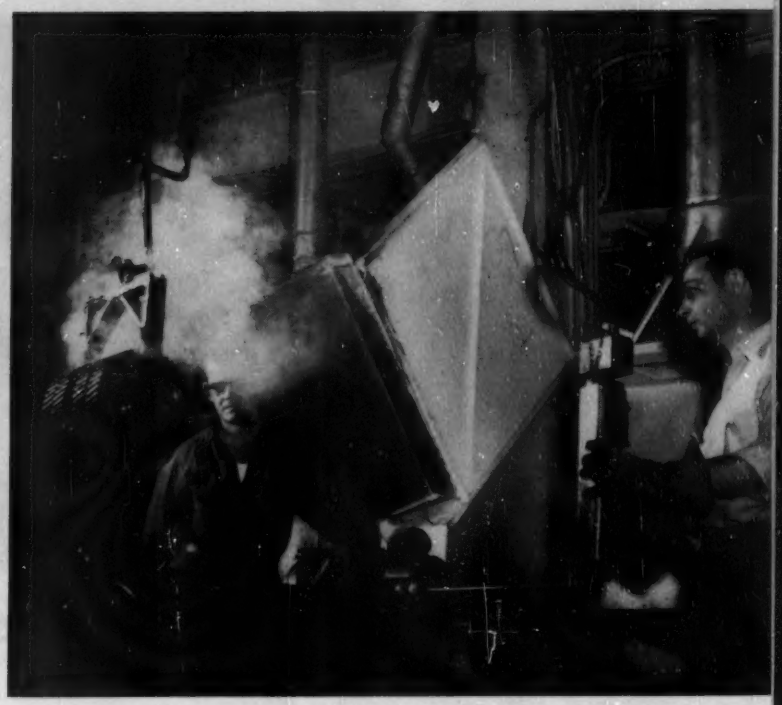
Our former process was to carburize at 1650 F and direct quench after reducing the furnace temperature to 1550. This gave us a refined core, but sufficient distortion remained to require finish-grinding the teeth. Double quenching made matters worse because the chemistry of different heats of steel would vary enough to make it impossible to tell at just what temperature the gear would expand or shrink.

Other methods such as selective carburizing, and direct single quenching, and other materials such as medium-carbon alloy steels, etc, were tried, but the desired physical properties were not obtained or dimensional changes would occur.

Our problem was to find some fast means of heating the teeth of the gear without decarburization. At this point we went to the "liquid-flame" heating.



CARRYOVER OF SALT on spinning gears protects teeth from oxidation



FIXTURE WITH HEATED GEARS (drive uncoupled) is plunged into adjacent oil quench

in salt...

CHARLES G LEE, chief metallurgist, MICROMATIC HONE CORP, DETROIT

SPUN FOR 4½ MINUTES

Processing of the gears with the liquid-flame heating operation comprises the following operations: Gears (cut from upset blanks) are normalized, annealed and then machined. Next, the gears are carburized for 6 hr at 1650 F in a gas-carburizing furnace. They are then directly quenched in oil at 120F.

We do get distortion on carburizing and quenching but the gears are drawn at 1100 F, which gives us a hardness in the machining range. As a general rule, stock is removed from the ID and OD as necessary to prepare the gears for final localized hardening. The broached ID has a tendency to close in approximately 0.0005 in. during final hardening, but this can be rebroached afterwards.

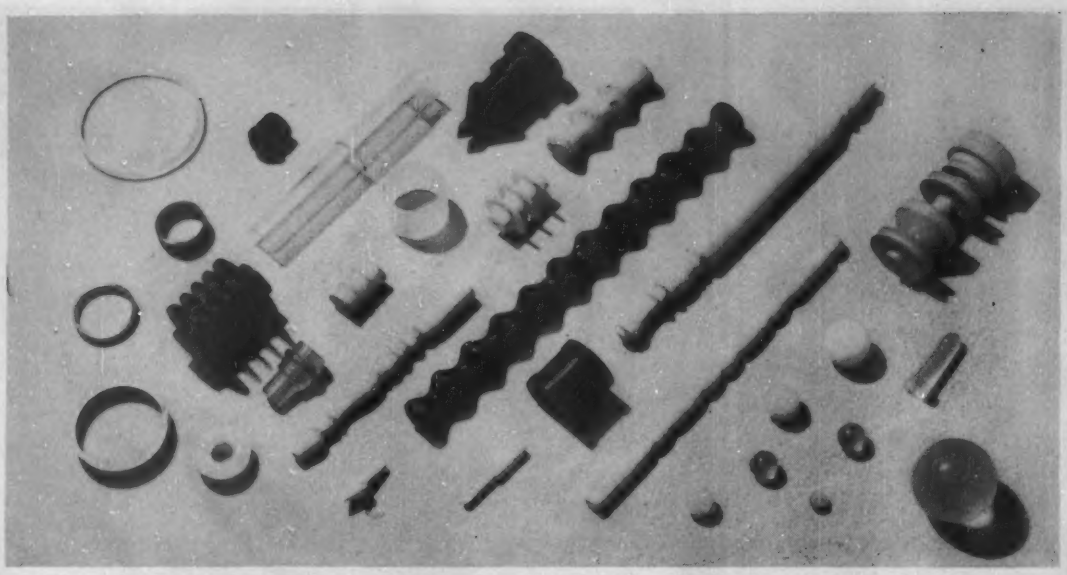
The gears are then locked to a shaft. This shaft is free to rotate within a fixture, which is held over the salt bath by a monorail hoist. The gears are lowered until only the teeth are immersed in the bath. A variable-speed drive, mounted on a portable stand adjacent to the furnace, is then coupled to the shaft.

Four gears on one fixture are rotated at approximately 76 rpm for 4½ min. The Ajax electric salt bath is held at 1540 ± 5 F by means of a thermocouple-actuated pyrometer controller. Salts employed are a mixture of potassium chloride and sodium chloride.

When the teeth are up to temperature, the fixture and gears are removed from the furnace and quenched in agitated oil held at 120 F, then drawn at 500 F. Present capacity is 64 charges of four gears each for a 16-hr day.

HELIX ANGLE UNCHANGED

After final treatment, the pitch diameter and ID are within 0.001 in. of the original size. Also, the pressure angle and helix angle remain unchanged. Distortion is minimized both by the selective hardening method and the fact that direction of loading is perpendicular to the direction of grain in the upset blank.



SAMPLES OF CENTERLESS-GROUND NON-METALLIC MATERIALS are mainly wood, Lucite, and cellulose acetate. Longest part spans a shade over 4 in. Other materials ground by the same kind of tooling are Teflon, nylon, cork, hard rubber, polystyrene, butyrate, and Catalyn

How to centerless-grind parts of

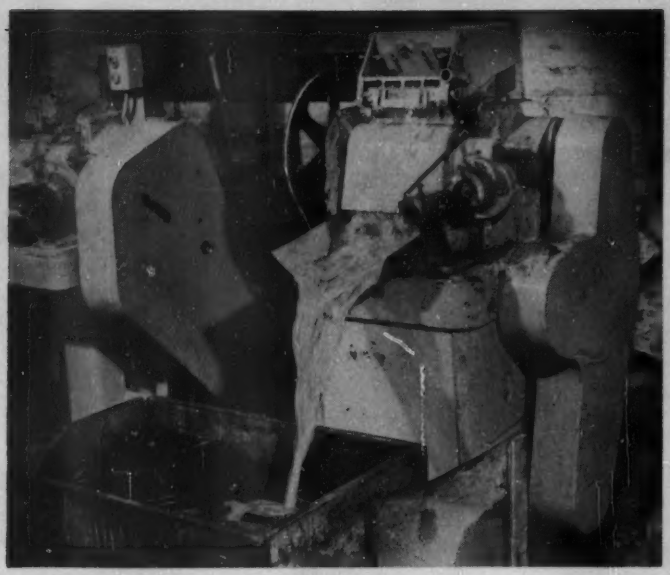
It's easy to centerless-grind small cylindrical or round parts of wood and plastic; but it isn't always profitable. The trick is in keeping tooling cost down, production per dressing up. Answer: Crush-dress grinding wheels

Crush dressing has been used for about eight years at Orange Products to produce complex ground cylindrical shapes economically. Instead of requiring expensive diamonds and intricate tooling for forming the shapes on the wheels, ordinary cold-rolled-steel cylinders can be turned on the lathe, then crushed into the wheels to produce the required shapes. Regulating wheels are formed the same way. Anvils, on which the work rests during the grinding cycle, are ground with the work wheels so they will project into wheel recesses to prevent parts from dropping through the machines.

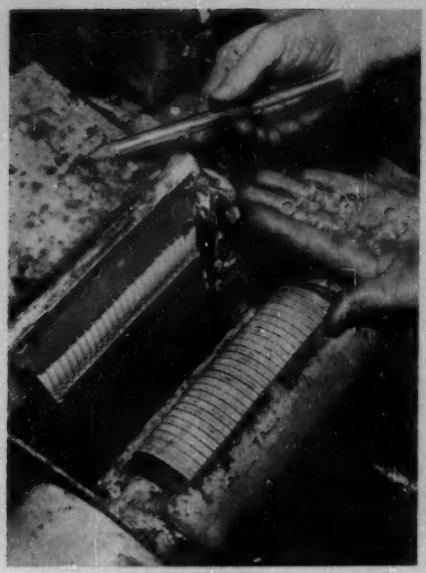
In this jobbing shop, hundreds of wheels are kept in stock for future reorders, but because tooling and labor costs involved in producing wheels to shape have been relatively low, a large inventory does not represent an excessive investment.

Production costs are also low; machines need attendance only to fill hopper feeds and to check for quality once in a while.

Wheel redressing is necessary from time to time, but it is a simple matter to true up the crushing rolls to bring back the proper shape and to recrush the wheel on the lathe. Wheel diameter is seldom reduced greatly.



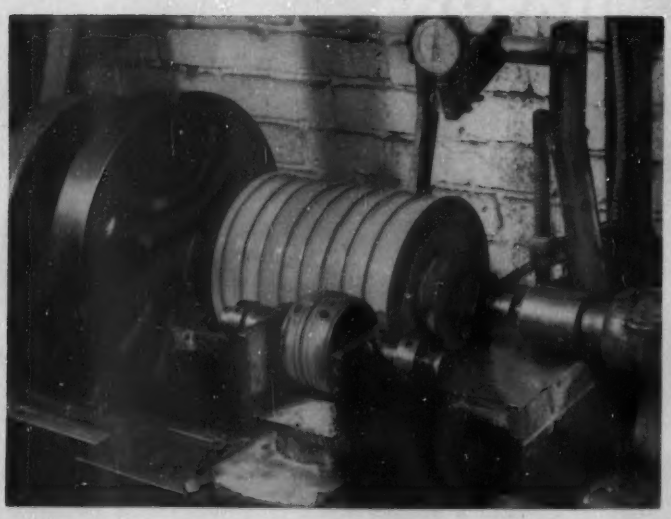
CENTERLESS GRINDER WORKS CONTINUOUSLY and automatically, once started up. Hopper feeds 7¼-in. lengths of black acetate stock with ¾-in. dia. Wheel is dressed to produce three switch handles per cycle, and cut off. Water coolant washes completed parts onto screen. Wheel speed is about 3600 rpm



LUCITE BATTERY RINGS have U-shaped outside contour; are ground from Lucite extruded stock that yields 26 rings per 7-in. length. Depth stops on carriage operate mechanism that pulls back idler wheel when parts are finished, letting rings drop from anvil down onto tray below. Heavy ridges on wheel are cutoff sections; forming recesses (not visible) are between them

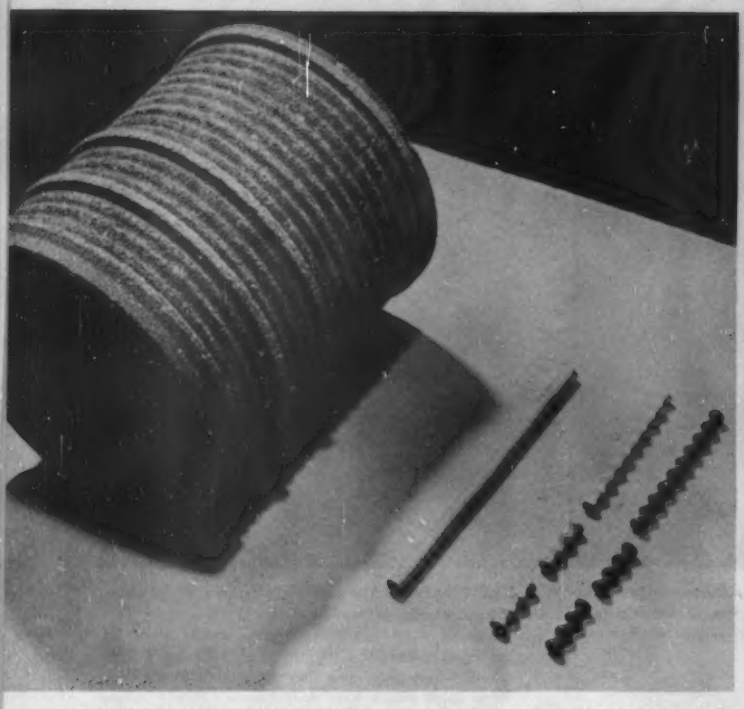
plastic and wood rod

CHARLES GENTILE, LEONARD SCHAPER,
ORANGE PRODUCTS, INC, ORANGE, NJ



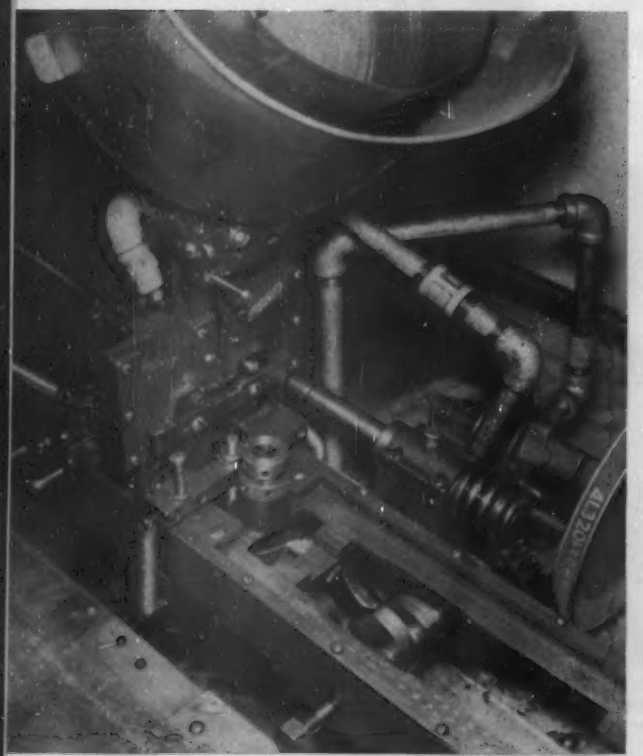
CRUSH DRESSING IS DONE ON LATHE with wheel mounted on dog-driven mandrel. Yoke on carriage carries cold-rolled-steel dressing roll, which was machined in toolroom. Dresser is free-running, rotated by grinding wheel. Water pan under wheel washes out grit particles. Wheel speed during crushing is about 80 rpm

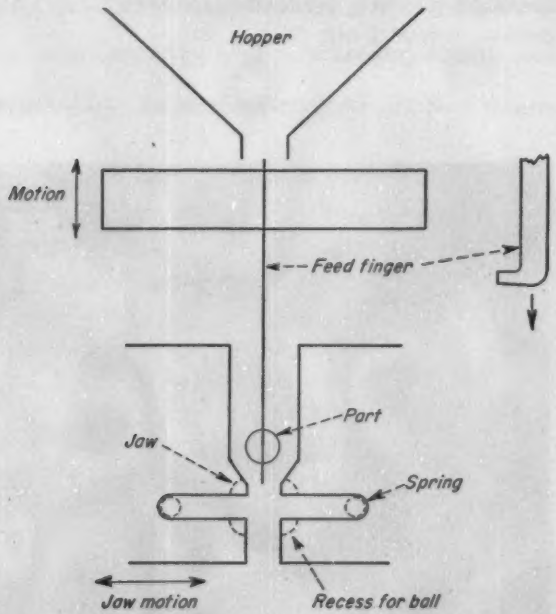
DIAL INDICATOR ON PERMANENT, HINGED MOUNT checks depth of crush and runout toward tailstock. For plastic, wheel is 80-120 grit; for wood, 46-60; both aluminum oxide. One dressing is normally good for whole run of parts, even into the millions of pieces. Between runs, wheels are stored, then checked and touched up when new run is scheduled. New wheel for a given job is almost never necessary



LOGSTIX FOR BUILDING GAME are produced from 7-in. wood stock (maple or birch) by several formed wheels that differ only in location of cutoff sections. Stock here is ground into three pieces with 3, 3 and 9 pitches. Darker set to right has been dyed and waxed. Other wheels grind pitches of 3, 5, and 7; 5, 5, and 5; and 5 and 11

DUMORE HEAD DRILLS END HOLES in ball-pen pushers of black acetate. Brass bushing plate guides drill as air cylinder feeds it to preset stop on drill unit. Fixture is spring-loaded to fall open unless operator pulls lever. Nest is cut to part shape to insure central hole





"LITTLE HORRIBLE" IS SALVAGED BUTTON-DRILLING MACHINE adapted to drill blind holes in hard-to-hold products. Feed finger lowers part from hopper into position to be clamped by double slotted jaws. These are cam-operated in the machine cycle; are nested to hold part accurately, and are replaceable. Power supply is ½-hp motor which runs setup at 40 strokes per min, automatically

American Machinist
SPECIAL REPORT
NUMBER 362

NON-CYLINDRICAL CONTOURS...

How you can Grind them

JOHN P. WRIGHT, associate editor

Intricate non-cylindrical shapes — either external or internal — have for many years created serious problems for design and production engineers. To help solve these problems, we have here assembled and illustrated principles and current techniques of contour grinding. Also included are latest applications, such as the tri-lobe contour for driveshafts and couplings to replace conventional splines or keys

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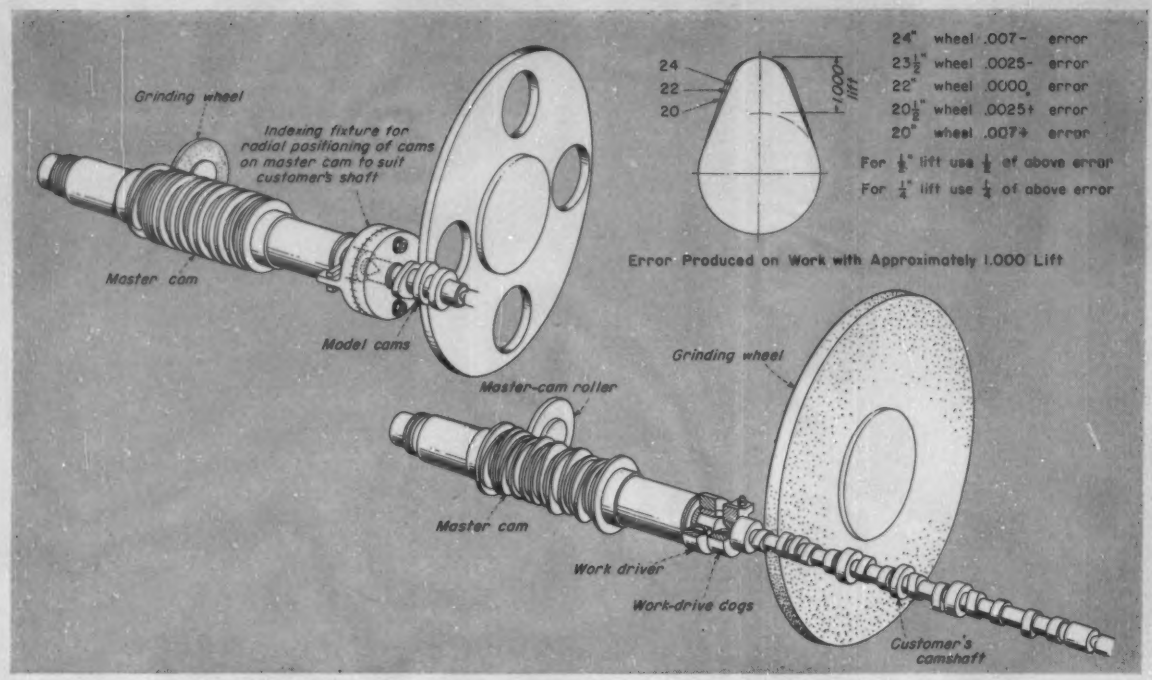


PRINCIPLE of generating master cam and grinding work with roll follower. Note chart indicating amount of work error through a given lift, as calculated grinding-wheel diameter diminishes from high to low

Basic principles of cam grinding . . .

Contour shapes have been neglected because of the difficulty in machining, particularly grinding, and the prohibitive costs of manufacture. Nevertheless, it is not possible to eliminate such shapes. Just to mention a few, consider the need for grinding camshafts, elliptical pistons, roll forms, distributor cams, equilateral polygonal shapes, eccentrics, and cams with re-entrant curves.

The designer of contour-grinding equipment usually has two main lines of approach to this problem. The first involves the application of a master cam as the medium for duplication. The second is the actual generation of the contour desired by means of a suitable mechanism. By present-day techniques, both approaches must be used at one time or another.

If the principle of contour grinding involves the use of a master cam, the machine will be equipped to vary the position of the axis of work rotation with respect to the face of the grinding wheel. If, on the other hand, the machine is equipped with a purely mechanical drive, the generating principle generally involves varying the face of the grinding wheel with respect to a fixed axis of rotation of the work. This repositioning of the face of the wheel with respect to the axis of the work is the essence of non-cylindrical grinding.

Most cam - contour - grinding equipment ranges from high-production models to cam-grinding attachments for plain and universal grinding machines.

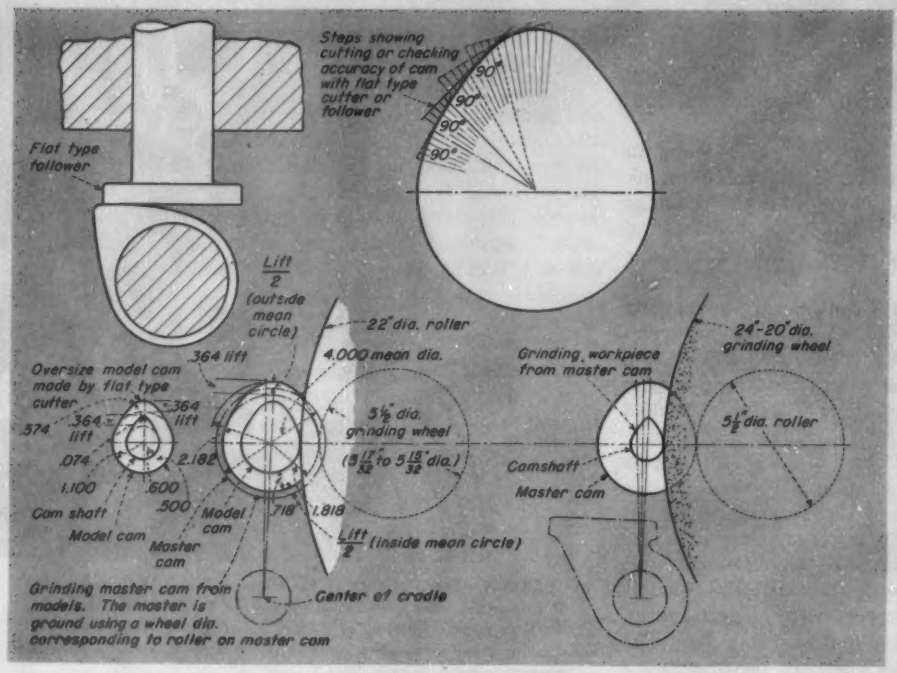
The desired shape can be any contour within the reasonable limits practiced by machine designers, and can be ground on work either internally or externally.

One of the features of the cam-contour grinder in the United States is that there are no gear trains involved, which eliminates any inaccuracies that might be present in this type of drive.

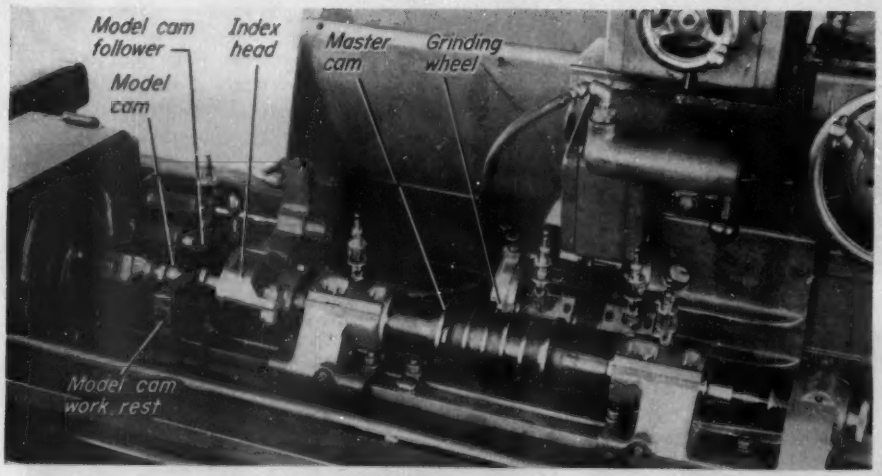
Some workpiece cams are held on arbors or fixtures on the nose of the master-cam spindle. Others, such as automobile camshafts, are carried on centers, one center being in the master-cam spindle and the other in a footstock clamped to a swinging member or rocking bar. This bar is supported in bearings attached to the grinding-machine table.

Models and masters

A large layout (from 10 to 40 times actual size) of the profile for each cam or shape is made and the radii and lift for each degree of rotation is computed. Toolmakers using special machines make a model from tool steel the exact shape and size of each different cam required. Extreme care and ac-



PRINCIPLE of generating and inspecting one type of model cam, master cam, and workpiece. Note contour of cam which permits use of flat cutter and follower



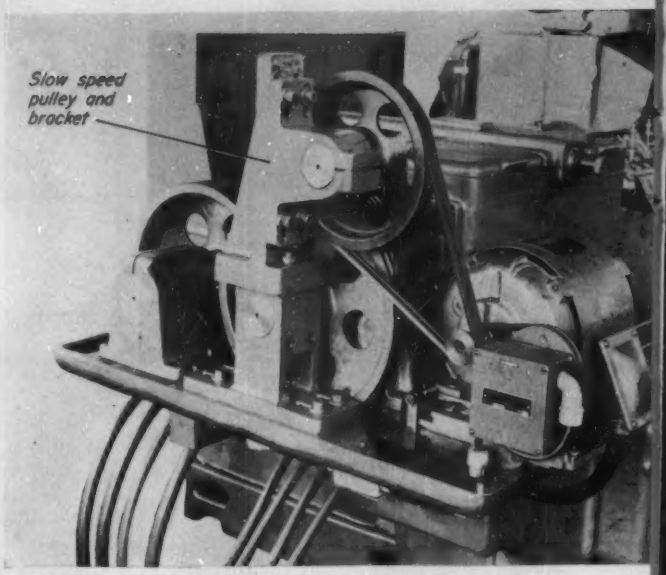
CAM-CONTOUR GRINDER mounted with a master-cam-grinding attachment. The model cams, follower, and index head are at extreme left of machine. Follower is a radius shoe plate cut to same radius as grinding wheel which is used in standard machine for production grinding of cams

SOFT MODEL for making master cams at Dodge Main Plant is hand-shaped in highly accurate optical indexing head according to computed angular dimensions. Microscope on head permits indexing to seconds of an angle. Model has one intake, one exhaust cam, with starting points of contours located 190 degrees apart. Same head is employed for checking work between centers with 0.0001 dial indicator with follower showing cam rise

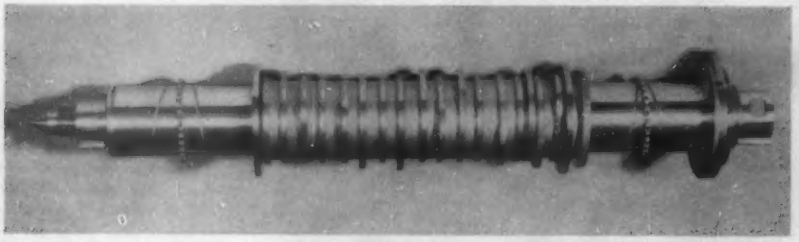
curacy is involved in making the models, as the slightest errors in the model may be magnified in the product. Even though this work is held to the closest tolerances commercially possible, absolute perfection cannot be attained.

Checking of the model-cam contour is done in a testing machine using an optical measuring instrument or other similar equipment, whereby readings of lift accuracy can be made from 0.000050 to 0.000025 in. for each degree of rotation. Angular setting is accurate within 0° 1′.

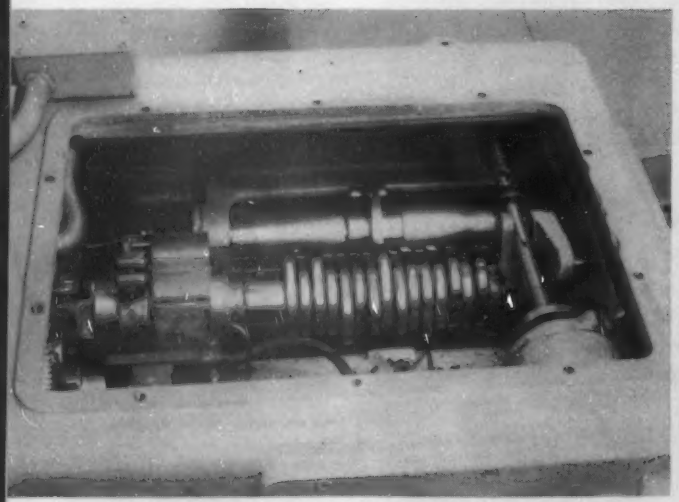
Model cam is placed in a special cam-generating machine (master cam grinder) and the hardened master cam is ground. To check accuracy of the master, it is placed in the cam grinder and a trial workpiece is ground. Correctness of work is checked to same degree of accuracy as is the model cam. As an example, at the Dodge Main Plant, master cams are generated for grinding the camshafts for the new V-8 engines. Here, toolmakers rough out the models to within 1/16 in. of the required size on a cam-grinding machine using an old master cam having approximately the desired contours. Models are then mounted between centers in a special setup where they are hand shaped to final dimensions. The soft model is then used as a master for grinding a



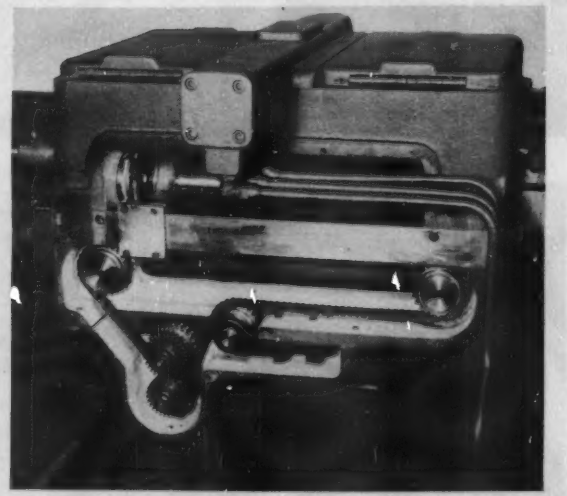
AUXILIARY HEADSTOCK DRIVE for master-cam-grinding attachment. This drive acts as a means of slowing down the speed of headstock. Master cams are ground at 8 rpm for roughing and 4 rpm for finishing. Slow-speed pulley and bracket are disengaged for normal production-grinding operations



TYPICAL MASTER CAM and spindle assembly. Sprocket chains distribute lubricating oil evenly over bearing surfaces



INSIDE OF CAM HOUSING, showing master-cam spindle, roller, and a portion of the rocking bar. The rest of the rocking bar extends beyond this housing, and by means of brackets, is clamped to the machine table



GEAR CHAIN DRIVE for indexing roller follower on master cam. As worktable is positioned from one cam to the next, gear rack attached to table drives roller chain

hardened tool-room model, from which the final master cam will be made. Finished tool-room model is ground at a ratio of 2:1 to the master cam.

Master cams are made from non-distorting oil-hardening tool steel, and contain eight exhaust and eight intake cams. After rough grinding they are hardened to R. 60-62. Before final grinding, the centers and all shaft diameters are finish-ground. Dodge mechanics emphasize the importance of making the toolroom models twice as large as the master cams and these in turn at a ratio of 4:1 to workpiece camshafts. This technique minimizes errors in reproducing contours as an error of 0.001 in. in the model is only 0.0005 in. in the master, which will be only 0.00012 in. in the workpiece. In addition, master cams are designed to allow for contour changes in the camshafts resulting from grinding-wheel wear between 24- to 19-in. diameter on large production runs. Normally 0.001 in. is added to the master-cam contour for each 45° of contour per 1 in. of wheel wear.

Cam and roller mechanism

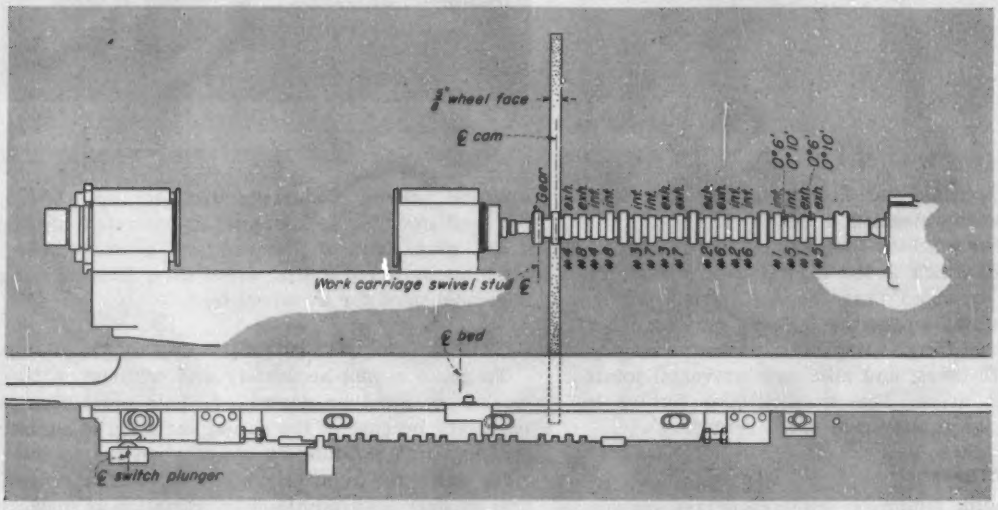
One type of cam roller is carried by a shaft in the rear portion of the workhead. Indexing of the roller in some cases is accomplished by a bronze yoke moved by a roller chain driven through gears from a rack attached to the bed. As driving power is secured from movement of worktable, once the mechanism is set, the roller cannot get out of time. A flat follower is used when there are no flat surfaces or reverse curves on the master cam. This type of follower is specified from a manufacturer's standpoint as being easier to make and more accurate than a round follower. When there are reverse curves, small cutters and small followers have to be used in developing the master. The grinding wheel is limited in size so there will be no interference on a reverse curve.

Another device for indexing the roller is hydraulically operated and provides semiautomatic operation of cam units for grinding camshafts. By its use, manual operation of the rocking bar and shifting of the roll is eliminated and cam grinding proceeds exactly like grinding a series of round bearings along a shaft.

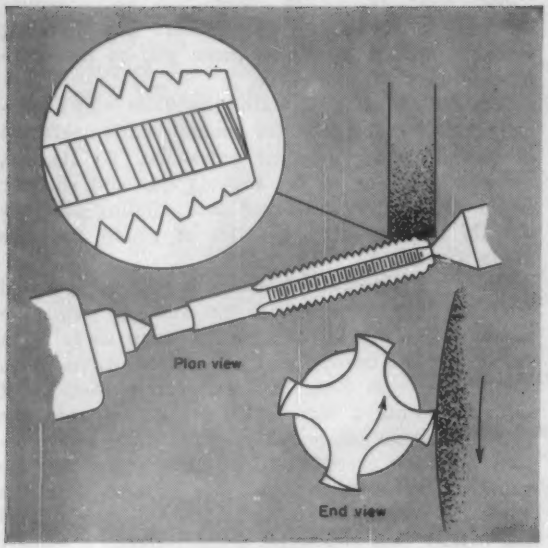
On a semiautomatic machine, a counter operated from the rocking bar causes the cradle to swing the master cams into contact or lift them away from roller, per the desired number of revolutions. With the master cam clear of the roller, movement of table to locate a cam to be ground opposite the grinding wheel automatically shifts roller to a position opposite corresponding master cam. As the grinding wheel is brought into contact with the work the rocking bar is released so engagement of the master cam and roller is established.

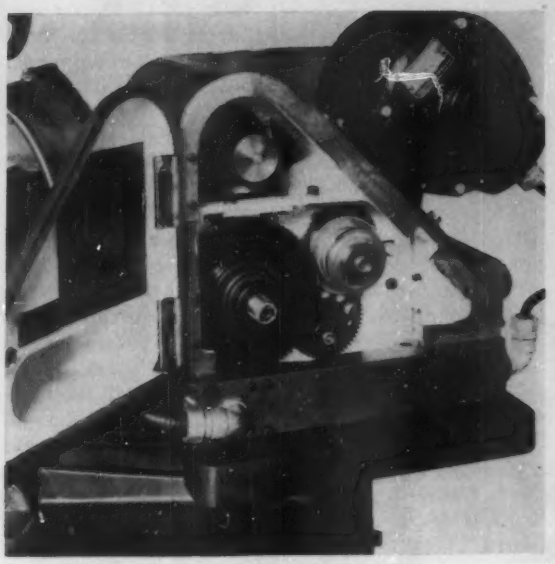
Workhead

The cam-grinding units consist essentially of three main parts, namely, work-drive unit, cam housing, and rocking bar. The work-drive unit transmits power from the electric motor mounted on top of master cam spindle which in turn drives the camshaft. Power from the motor to work-drive unit is transmitted by V-belts, and power from work-drive unit is transmitted to master cam spindle by an especially designed, smoothly - operating coupling. The cam housing encloses the master-cam spindle, master-cam rollers, and a portion of the rocking bar. The remaining portion of the rocking bar extends



LAYOUT OF SPACING bar for positioning grinding wheel to correct cam on work and indexing master cam follower accordingly





How to grind tap-point relief

The rocking-cradle principle is used for grinding tap relief in 2-, 3-, 4-, or 5-fluted taps. An eccentric adjustment is provided for amount of relief, and may be varied from zero to maximum of 0.030 in. on the tap. Change gears are used to modify the setup for various flute arrangements and to regulate rocking action of cradle. Work table may be swiveled to accommodate various tap angles from zero to 65°

beyond this housing, and, through suitable brackets, is clamped to the machine table.

Still another machine-tool builder has the work-head spindle, which is the master cam, driven by V-belts, so arranged that the final drive pulley, which is mounted on the master cam, may oscillate. This is required for grinding cams, without changing belt center distance, and eliminate universal joints on the final drive. The work-driving fixture is clamped to the master-cam work center.

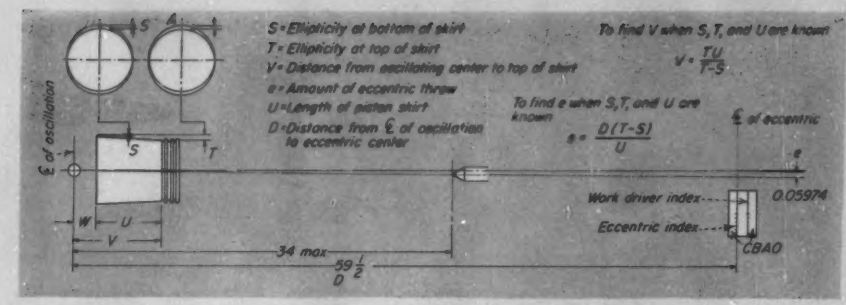
GENERAL FEATURES

The hydraulic automatic indexing is fast, smooth, and simple in operation. Timing is accomplished by a motor-driven mechanical timer. The grinding wheel breaks away from work at any point of cam rotation without disturbing accuracy of contour.

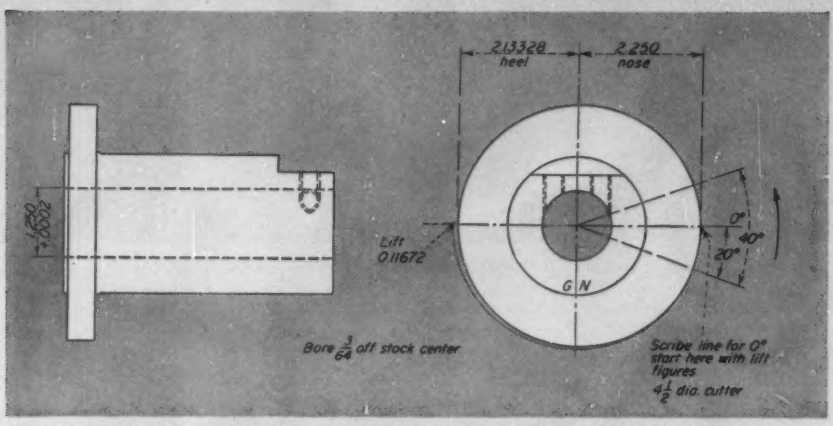
The diamond-wheel dresser is mounted on the wheel base. Feed of diamond and grinding wheel are interconnected so that wheel wear from dressing is compensated for by wheel feed.

Control of surface speed

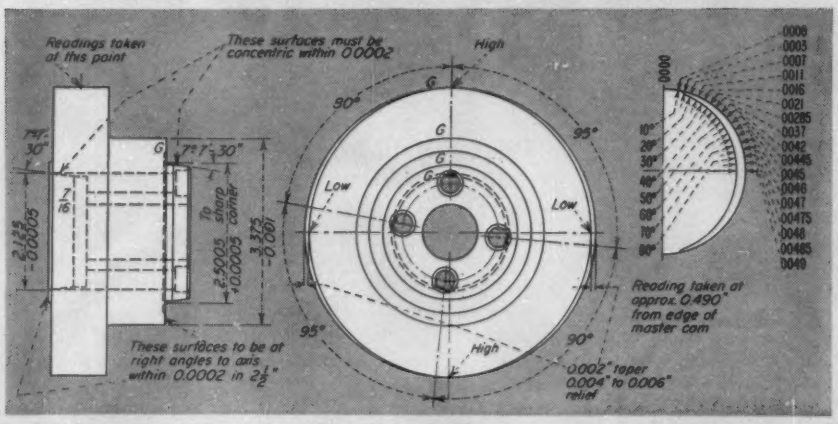
To grind a cam accurately and without chatter, work rpm must be controlled. This precaution is necessary because of the actual variation of surface speeds which is bound to occur when the follower rides down the relatively steep sides of a cam or crosses over high points. This variation is directly attributed to work surface speed and is responsible for chatter in the cam. To maintain a constant surface speed by varying angular velocity as the cam


S=Ellipticity at bottom of skirt
T=Ellipticity at top of skirt
V=Distance from oscillating center to top of skirt
e=Amount of eccentric throw
U=Length of piston skirt
D=Distance from ℄ of oscillation to eccentric center
To find V when S, T, and U are known
V = TU/(T-S)
To find e when S, T, and U are known
e = D(T-S)/U
℄ of oscillation
℄ of eccentric
Work driver index
Eccentric index
0.05974
CBAO
34 max
59 1/2
D

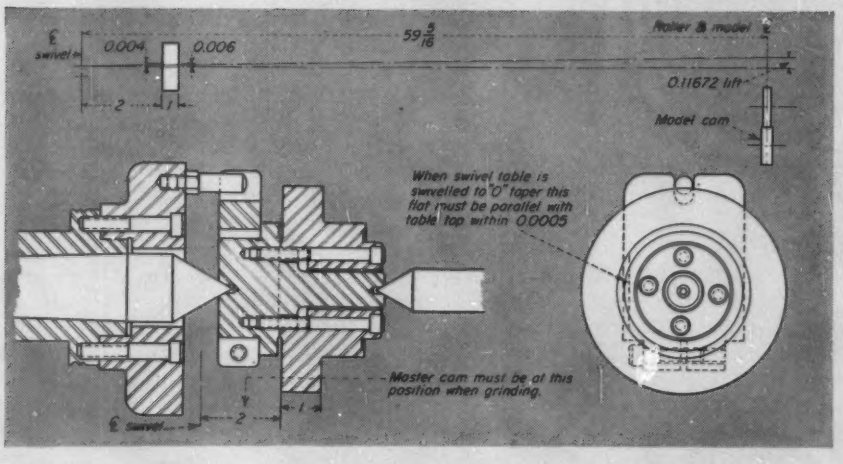
SETUP DIAGRAM for developing adjustable eccentric and/or model cams for a special piston grinder. The attachment will grind pistons with a varying taper from top to bottom. It is even possible to grind from a perfect circle on one end to a taper on the other. This is desirable on piston designs to compensate for the coefficient of expansion when mass of metal is non-uniform.



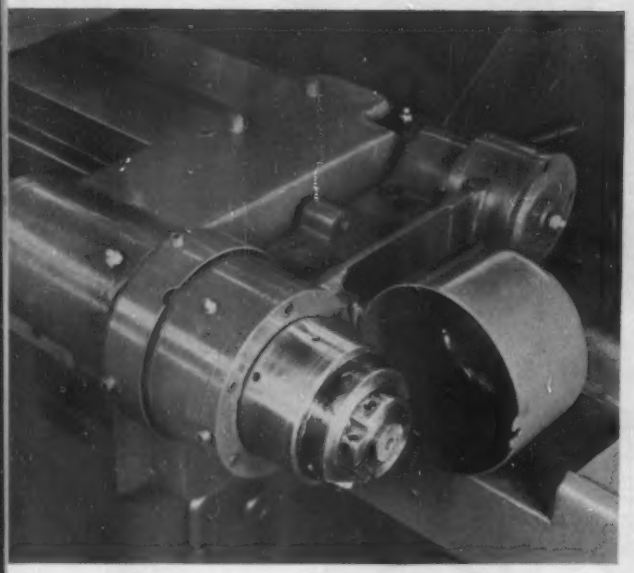
MODEL CAM developed from setup diagram and used on special attachment to make master cam. Model is mounted at footstock end of swivel table to provide a lift of 0.11672 in., based on figures obtained from diagram to provide a piston with 0.002-in. taper and 0.004 to 0.006-in. relief


Readings taken at this point
These surfaces must be concentric within 0.0002
High
Low
90°
95°
These surfaces to be at right angles to axis within 0.0002 in 2 1/2"
Reading taken at approx. 0.490" from edge of master cam
0.002" taper
0.004" to 0.006" relief

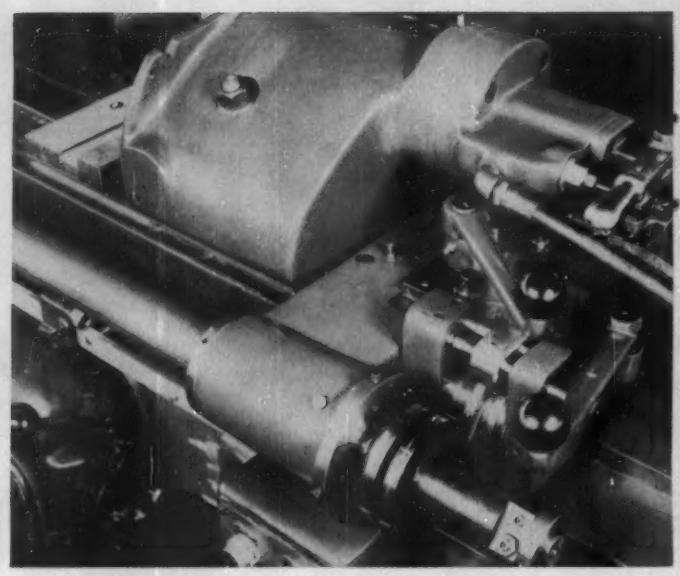
MASTER CAM generated from model. Note master has straight sides at high points, and tapered sides plus relief at low points. This same contour will be imparted to piston by master cam mounted in special attachment


℄ swivel
0.004
0.006
59 5/16
Roller & model
0.11672 lift
Model cam
When swivel table is swivelled to "0" taper this flat must be parallel with table top within 0.0005
Master cam must be at this position when grinding.

WORK DRIVER and setup for generating master cam on special attachment. Note relationship of driving pin and flat for establishing high points on master. Schematic layout and position of master indicates how taper and relief is provided at low points of cam. When master has been completed, piston is mounted directly to hub of cam and positioned in correct relationship by locator pins nested in wristpin holes of piston



ADJUSTABLE ECCENTRIC mounted at end of swivel table of special attachment for providing progressive relief and taper on pistons when desired. Pistons can be ground from a perfect circle on one end to a taper on the other end by locating the centerline of oscillation within the same plane as the full diameter



SWIVEL-TABLE MOUNTING for special attachment equipped with a model cam and a round roller. This setup is used when an eccentric will not develop the proper shape. The follower is shifted to the round roller when perfectly round pistons are to be ground

rotates, a sensitive hydraulic motor drive is used. The rate valve regulates the rpm of motor by a cam synchronized by the rotation of work. As the grinding wheel approaches the difficult areas of the cam, angular velocity slows down to maintain constant surface speed. This arrangement is not important when stock is removed rapidly, but is necessary for the last few grinding passes of the work.

Another design has a motor-driven mechanical timing mechanism, with a range of 0 to 60 sec, located in the main electric control cabinet. It regulates high and low speed of work rotation and length of grinding time. All operations are interlocked and sequence is positive.

TYPES OF CAMS AND POLYGONAL CONTOURS GROUND

1. Conventional automotive camshaft types
2. Miscellaneous types of single cams, eccentrics, elliptical-pistons, piston relief, roll-forming cams, and distributor cams
3. Cams having contours which include re-entrant curves such as diesel-engine cams
4. Polygonal contours—triagonal (tri-lobe), tetragonal, hexagonal, octagonal

Cam-Grinding attachments

The need for these attachments might best be summed up by saying that in many shops, the volume of cam grinding may not be sufficient to keep one machine busy on a full-time basis, and the machine must be used for other external or internal grinding operations. The time required to change over from cam grinding to conventional grinding is insignificant. Cams of different sizes and types as well as workpieces which are not true cylinders are being accurately ground on standard grinding machines equipped with cam-grinding attachments.

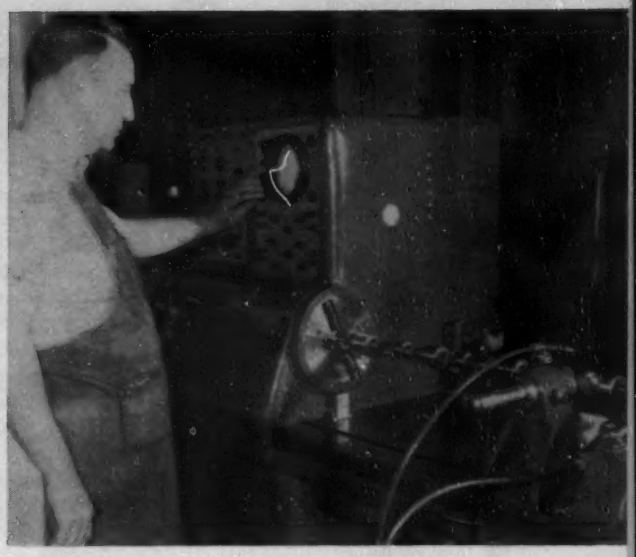
Piston grinding

The cam-grinding attachment operates on the same general principle employed in the high-production model. For piston grinding, the work cradle is mounted on a swivel table which, in many instances, is slightly swiveled in order that the pistons may be ground a trifle smaller at the head end than at skirt end. On a typical piston, a total of 0.015 in. stock is removed. Approximately 0.014 in. of this stock is taken off during fast table-traverse speed, and 0.001 in. during slower speed. Piston relief is from 0.004 to 0.006 in. on a side, and amount of taper is ordinarily around 0.002 in.

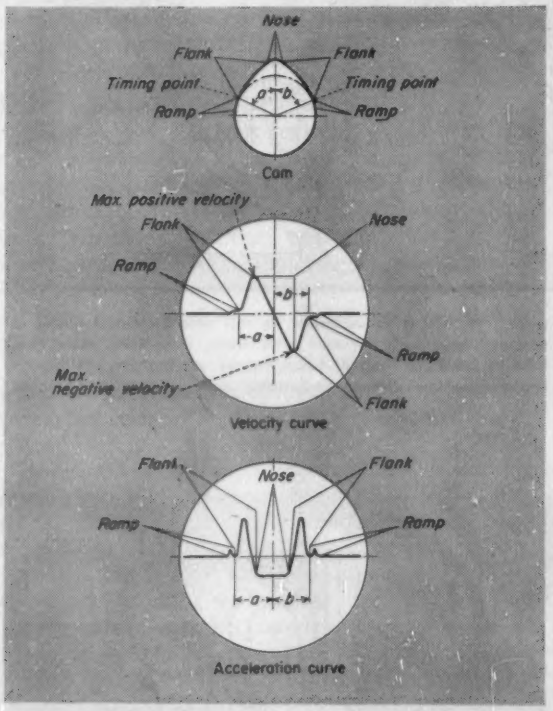
Work cradle, which is of the underslung type, is supported by bearings at both ends of table. A cam mounted on the headstock spindle, because it operates in contact with a roller attached to the swivel table, gives a swinging motion to the cradle as the cam revolves. A hydraulic piston swings the cradle from the roller when each piston is finished. There are various types of piston grinders. One model will grind a piston which has a contoured shape throughout its length. This type of piston is not tapered. Means are provided on the master cam and follower to adjust the amount of eccentricity if a new piston design is to be ground.

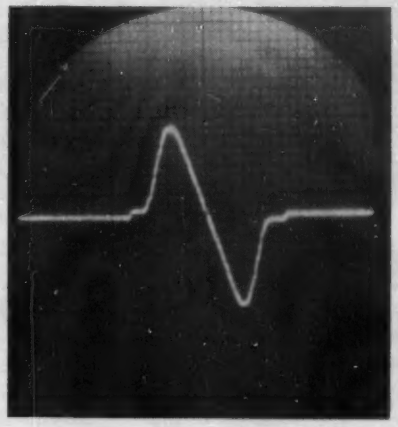
A second model will grind pistons with a varying taper from top to bottom on a special attachment.

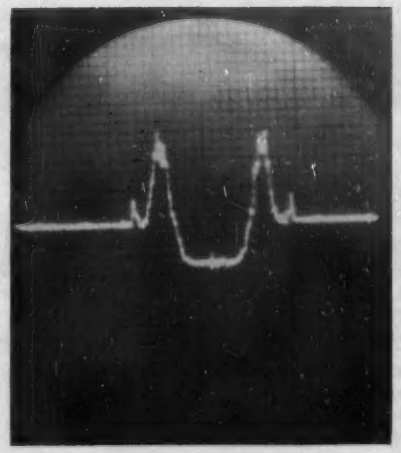
CHECKING THE ACCURACY of rise and fall of work cam against figures supplied by customer. Optical instrument is capable of giving readings of the lift to within 0.000025 in. for each degree of rotation, with angular settings accurate to 0°-1'



AN OSCILLOSCOPE is used to give a visual record of cam characteristics. As the cam rotates against the follower, magnetic impulse generator picks up the signal and projects the resultant varying voltage on an oscilloscope screen. Work can be rotated at speeds simulating actual functional rpm's

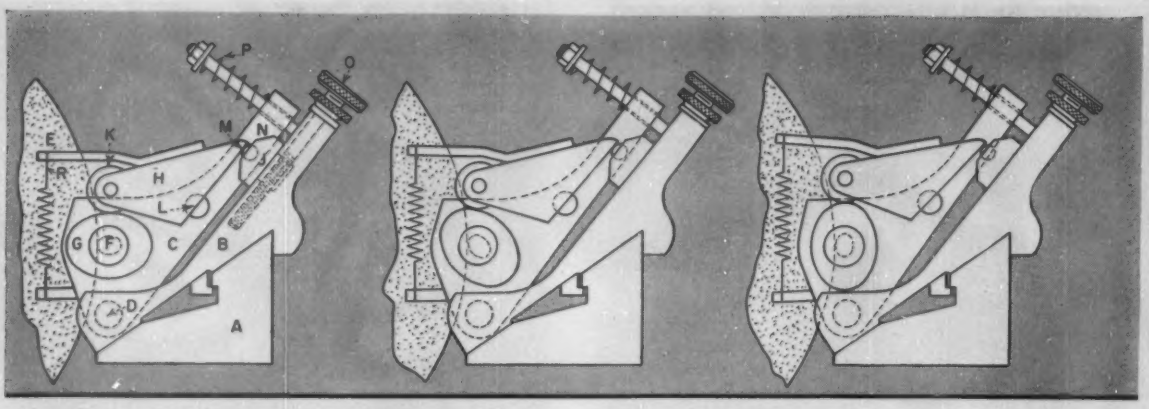




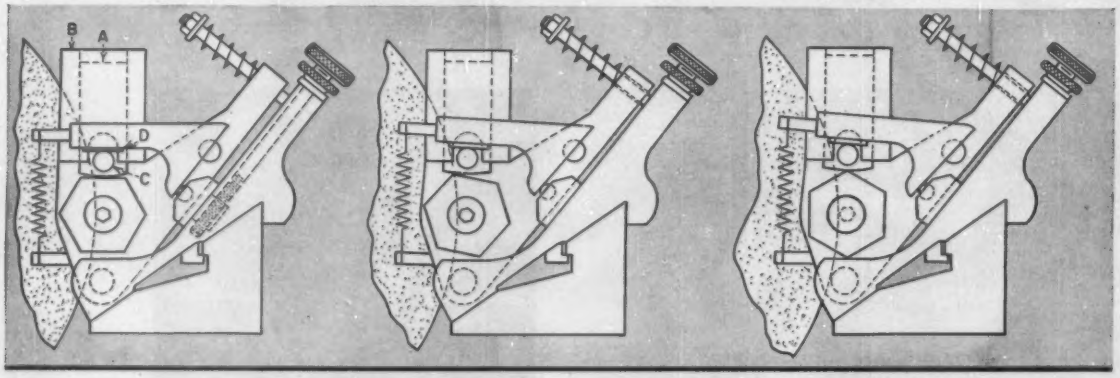


Velocity and Acceleration chart

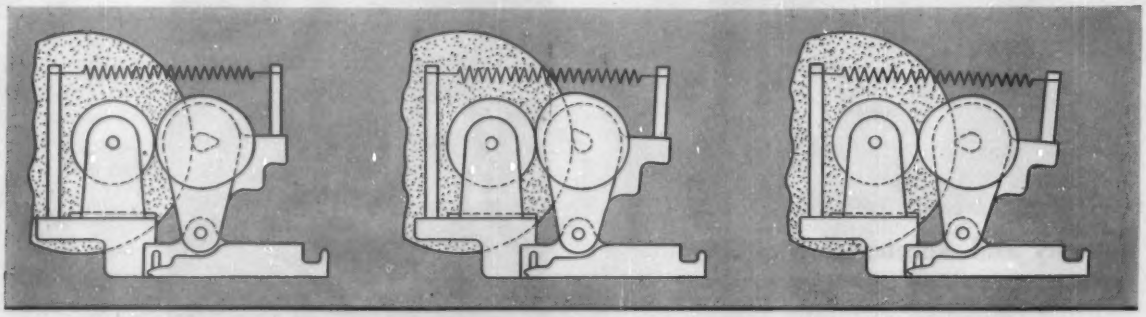
After the cam checks out on oscilloscope reading, a hooded camera is mounted on the screen and photographs taken of the velocity and acceleration curve of each cam. Photograph serves as a permanent quality-control record that master cam and work, ground from master, are mathematically and functionally correct. Two photos illustrate velocity and acceleration curve on exhaust cam of a camshaft



Negative Contour . . . Machine table *A* is locating surface for trunnion brackets *B*. Cradle *C* rocks toward and away from grinding wheel *E*. Headstock spindle supports work *F* and working cam *G*. Rise and fall of *G* affect cradle *C* through arm *H* and fulcrum block *J*. Roller *K* rides on working cam. Rocker arm *H* pivots about bearing *L in the cradle*. Rocker-arm length rests on roller *M* which is part of fulcrum block *J*. Block *J* rests on bracket *B* which is fixed to machine. Positive contact between *M* and *N* is maintained by spring *P*. Spring *R* assures contact at other end of rocker arm. Note that fulcrum *J* can be adjusted by handwheel *O*. If *M*, *N*, and *L* coincide, cradle will not rock regardless of working-cam contour. This is one extreme of ratio adjustment. Motion of cradle is increased as lever arm *LN* is increased



Positive Contour . . . Follower *A* is separate from rocker arm and rides in slide housing *B* which is fixed to cradle. Contact between rocker arm and follower is through roller *C* and hardened plate *D*. Follower *A* has long contact surface with slight radius to compensate for shifting of point of contact between wheel and work with respect to centerline. In this arrangement, follower is designed specifically for cam with which it is used. Note that fulcrum block is located below center of fulcrum position in negative contour scheme. Adjustable ratio is also incorporated in this unit



Direct Action . . . has working master cam and work on same spindle. Spring load holds working cam against follower fixed to machine bed. As spindle rotates, high points on working cam forces entire rocking cradle away from follower and simultaneously away from grinding wheel. Continued rotation completes rocking of cradle as dictated by working cam. All rises and falls are reproduced in workpiece, only in terms of rise per degree of rotation

The third model, an attachment fastened to the table of a conventional grinder, will grind eccentric pistons. Generally the eccentricity cannot be varied unless the master cam is changed. Pistons can be ground on a taper if the swivel table is moved, but in this case the eccentricity at the large end and the small end will be the same. In other words, there will be no variation in eccentricity from top to bottom of piston.

Basically the rocking movement of the cradle during each revolution of the workpiece is controlled by the action of master cam against a follower roller. However, in applying this principle, one machine-tool builder believes that to grind cams of different shapes and sizes it becomes necessary to vary the design details of master cam, follower, and method of supporting and driving workpiece and master cam. This has led to development of three grinding attachments. Shape and size of cam to be ground determines which attachments should be used.

For grinding cams with a steep rise, the direct-action attachment is recommended. For example, to grind a new slipper-type piston of cut-away construction, because of the tendency of the piston to collapse, the negative-contour attachment was used. Furthermore, tolerances required on this type of piston were much closer than ordinary. To grind small cam workpieces and a hexagonal punch the positive-contour attachment was recommended.

Direct-action cam grinding

Direct-action grinding requires a working cam and the work to be mounted on the same rotating spindle. This spindle, or work-holding member, is supported in the cradle, which in turn rocks about its own trunnion bearings which are fixed on the machine. The rotating drive may or may not rock with the cradle. When it does not, a suitable universal joint is supplied to provide constant rotation as the cradle rocks.

As the cam rotates in a fixed relationship with the work, it rocks the cradle, thereby varying the distances between wheel face and centerline of workpiece.

The simplest generation scheme has the working master cam and work on the same spindle. The spring-loaded cam is rigidly held against a follower fixed to the machine bed. As the spindle rotates, high points on the working cam simultaneously force cradle and grinding wheel away from the follower. Continued cam rotation completes all rises and falls in the work, only in terms of rise per degree of rotation. There is room on the headstock spindle for mounting four master cams and provision for indexing the follower from one cam to another by means of a lever from the operating position. The work-drive bracket is equipped with an index head adjustable on the drive bracket and with a vernier scale. Initial adjustments that may be required between work and master cam can be corrected by means of the vernier. Cams to be ground are mounted on special mandrels and work dogs to permit alignment of work cams to the master cam. Correct angular relationship must be maintained between work and master to secure a minimum amount of stock removal and insure enough grinding stock all around for the cam to clean up.

One feature of this cam-grinding unit is the means by which master cams can be generated on the attachment itself. The only requirement for making a master cam is a finished part to the desired accuracy and free from chatter marks. Master cam is ground from a hardened blank (no previous roughing operations are necessary). Finished work is placed between centers in the usual position. It is then run against the bracket shoe which is mounted to the rear of the cam-grinding unit. Next, the cam-follower assembly is dismounted. Then the heavy-duty internal-grinding attachment is mounted on the grinding-wheel platen and its 6-in.-dia wheel positioned to the master-cam blank. As the work is rotated against the fixed shoe (shoe is same dia as the grinding wheel), the cradle oscillates and generates the desired master-cam contour. The accuracy of this reproduction is well within 0.001 in.

Negative-contour grinding unit

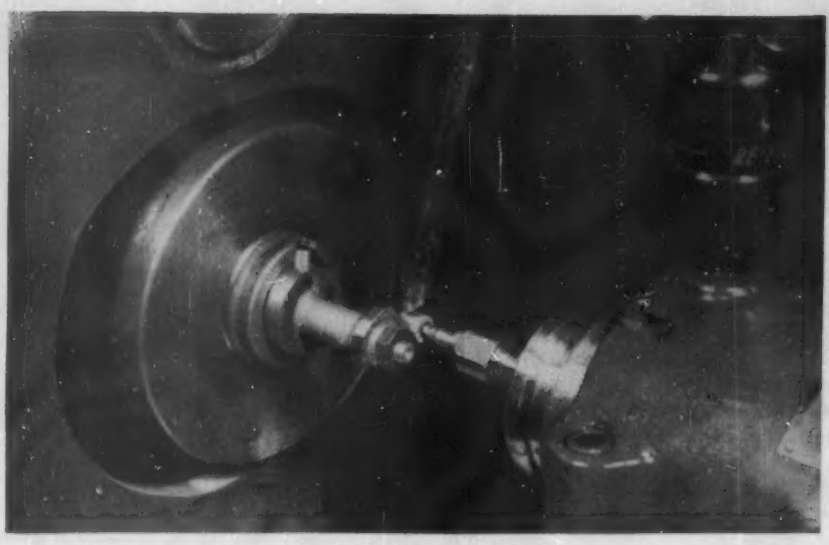
This generation scheme requires the use of intermediate follower system making the action indirect. By this method of cam generation the grinding machine produces a contour and workpiece exactly reversed from that of master cam. When the follower is at low point on master cam, the grinding wheel is at the high point of work. It can be seen from schematic drawing that motion transmitted to cradle from master cam may be varied from zero to any amount desired, within capacity of machine, without changing working cam itself.

Positive-contour grinding unit

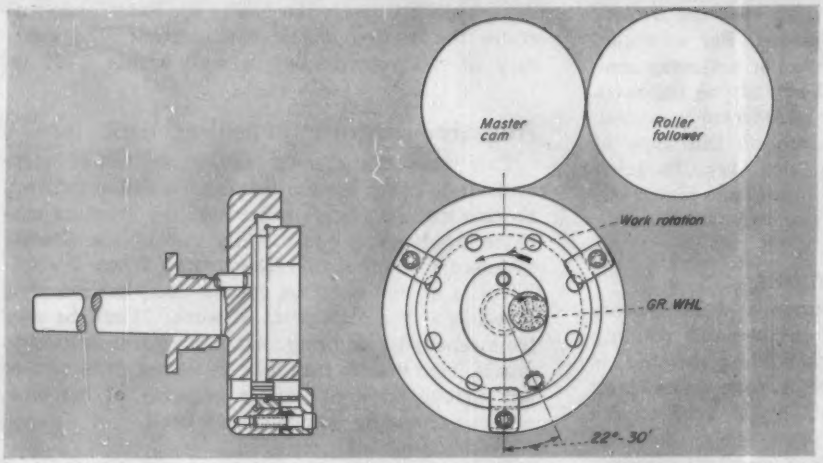
The advantage gained by using a reversed profile as described in the negative-contour unit cannot always be obtained because of the nature of the cam involved. Structural design and details involved in the positive-contour unit are essentially the same as the negative-contour arrangement. However, comparing the two systems from the drawings will show that there is an extreme difference in the type of follower employed.

Integral cams

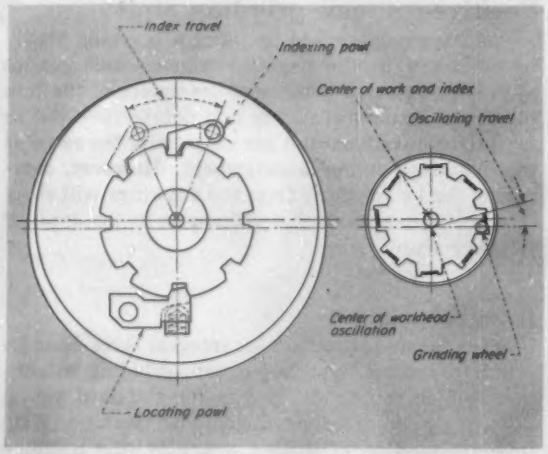
When small-production-lot integral cams must be ground, there is available a cam-grinding attachment which can be clamped to the standard swivel table of a plain or universal grinding machine. With this combination of tooling available, the machine may always be kept busy. Another advantage of this attachment includes grinding of cam-shaped diameters on any portion of long parts such as rifle barrels. The attachment is of the swinging-cradle type.



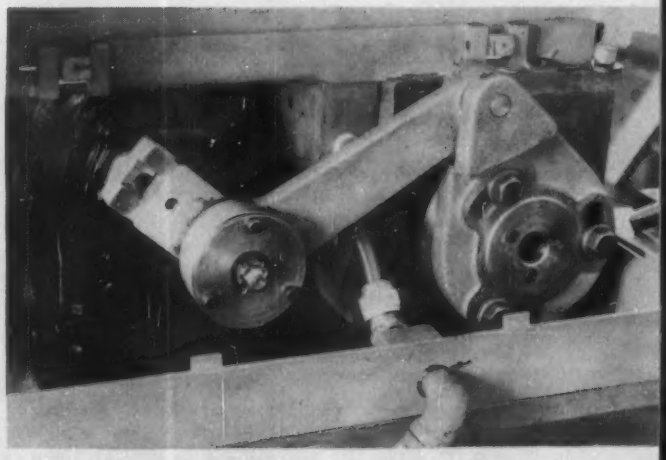
CONTOUR GRINDING an airplane-propeller pitch cam on a loose cam attachment. Clearance in spindle-housing frame permits oscillation of work spindle. Cams having a reentrant curve must be ground with a small-diameter wheel



MODEL CAM used to develop master for grinding loose internal cam on work. This job was done with a loose-cam attachment using a round follower. Contour readings on master cam, and point of contact with follower, are 180° to grinding wheel



INDEXING MECHANISM which was mounted on workhead spindle to grind internal segments eccentric to the OD. Indexing pawl rotates fixture through eight positions. When locating pawl is firmly engaged in slot, indexing pawl is retracted and does not engage slot in indexing plate until master templet is activated by piston



OSCILLATING DRIVE mounted at rear of workhead spindle controls travel of work segment in relationship to grinding wheel. Note adjustable features

Grinding camshafts is one of the most difficult operations, because of the irregular shape of the part and degree of accuracy required. When camshafts must be ground in large volume, one machine builder recommends a 5-in. hydraulic cam grinder, available with either a 26, 30, or 40-in. cradle and table. Stock removal runs as high as 0.120 in., and can accommodate wheel widths to 1¾ in. This same machine can grind tapered cams on a production basis.

One operator runs two machines, when grinding camshafts at the Dodge plant: One machine for rough grinding with a silicon-carbide wheel where 0.075 in. of stock is removed, and one for finish grinding where 0.010 in. of stock is removed. A constant work speed is maintained while roughing, while finish-grinding work speeds include seven fast cycles at 84 rpm followed by three slow cycles at 42 rpm. At finish grinding, a taper of 0.0015 to 0.0025 in. is produced on the face of each cam to permit turning valve lifters in the operation of the engine. Taper is provided by movement of the head relative to axis of the work, this movement being controlled by a solenoid action which cocks the grinding head at the finish of each cycle. Production rates run about ten pieces per hr.

Loose cams

The grinding of loose cams requires equipment capable of producing accurate work with a high finish. The master cam is mounted on work-spindle assembly to which a swinging motion is given by a cam roller as the master cam revolves. The attachment may be arranged in such a manner that the spindle assembly may be locked solidly out of contact with cam roller. This arrangement makes it possible to utilize the machine for conventional between-center-and-chuck grinding. The complete grinding cycle is controlled by a lever at the front of the machine. When this lever is pulled toward the operator, cycle is started and it is automatic without further attention.

Eccentric grinding

Another builder tooled up his machine to internal-grind eight eccentric segments on an overrun cam for a large automotive corporation in Detroit.

The operation required oscillate grinding in sequence eight internal cam segments located 45° apart, about the center of work. Segments are not concentric with part OD, as center of part and center of indexing are common and offset from center of workhead oscillation.

After each segment is ground by means of a size-control method the work is indexed through 45° to the next segment. The size-control method is a process for controlling work size by maintaining a constant relationship between diamond and wheel contact. Continuation of this constant relationship from one cycle to the next is insured during retraction by the feed box which purposely fails by a predetermined amount to fully retract wheel. This amount represents compensation for expected wheel wear during the roughing stage of the next cycle plus enough for sufficient wheel dress.

The grinding fixture is a spring-actuated three-jaw chuck offset 0.200 in. below the center of oscillation. The indexing mechanism is positioned at rear of fixture and consists of a plate with eight slots corresponding to work segments. Fixture is indexed by a hydraulically operated pawl, and a positive spring-actuated locator. When a segment has been completed and table has run out, a cam contacts a limit switch energizing a solenoid which in turn actuates a valve sending oil to the indexing piston. Oil pressure moves the pawl, which engages a slot on the indexing plate and rotates the fixture to the next segment. A positive locator diametrically opposite the pawl locks into a slot of the indexing plate. With fixture locked at end of index, precision switch causes the indexing pawl to return to its normal position and the wheel to be fed to the work. The work cycle begins with manual loading and locating of the work in the fixture by means of a hand plug. Cycle is started and machine table advanced at rapid transverse, slowing down to roughing speed just before the wheel enters work. Workhead oscillation commences and the grinding wheel engages work until roughing cycle is completed. The wheel backs off and the table runs out to dress, slowing down before the wheel contacts the diamond. The grinding wheel is dressed on table out-and-in stroke. As the table returns at finish-grind traverse, the wheel re-enters the work for several passes. Feed is stopped and sparkout timer started as a finish contact in the feed box takes over for retraction and compensation at conclusion of spark-out time. At this point, the wheel backs off and the table runs out from the work while the fixture indexes to the next segment. After the eight cycles, workhead oscillation automatically stops and table runs out to rest position.

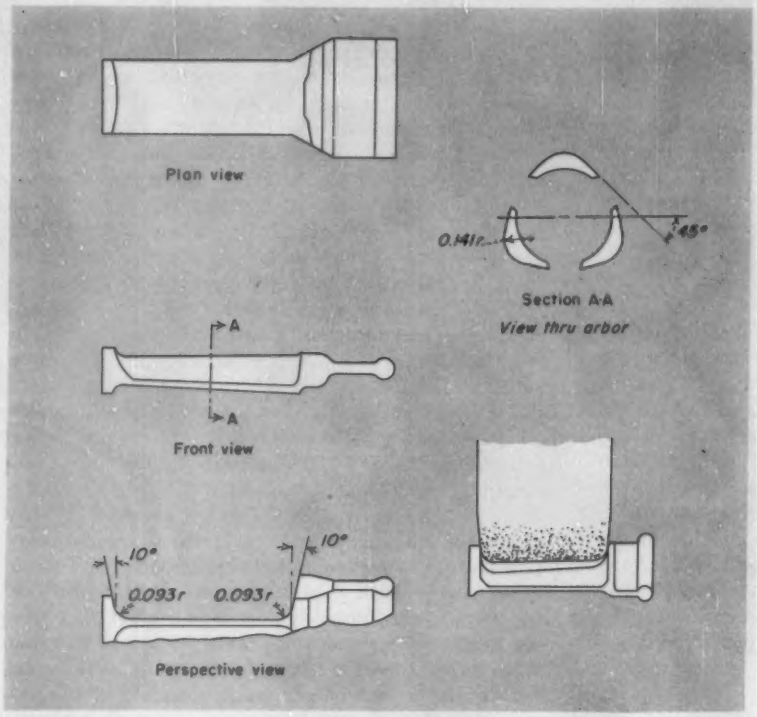
Grinding turbine buckets

This special application was performed on a plain cylindrical grinding machine equipped with a cam-grinding attachment. The operation consisted of grinding the form on the back of supercharger turbine buckets for an airplane engine.

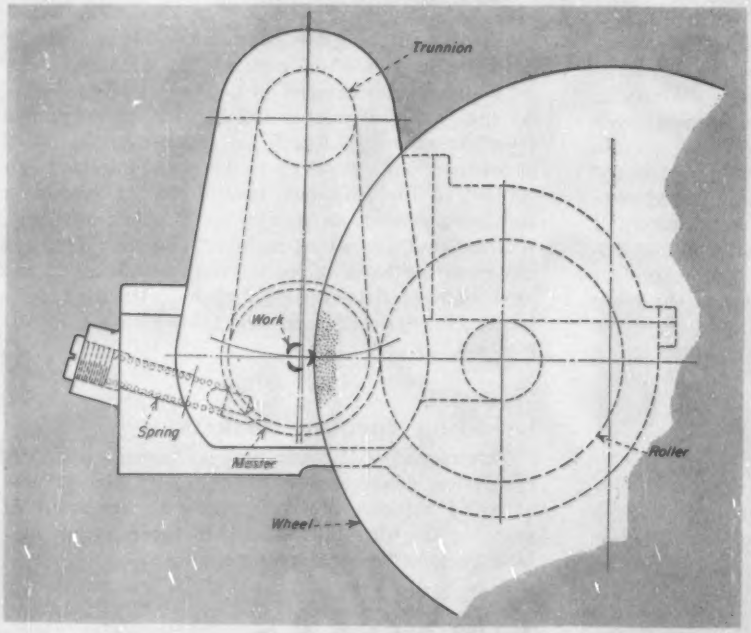
Tri-lobe drive shafts

The idea of polygonal driving shapes is not new. About two decades ago, the effort was made to interest the automotive industry in lobed, rather than splined or keyed, driveshafts. As everyone knows, it failed. Here is the sequence of events:

Norton Company has used triangular- (tri-lobe type driveshafts for certain mechanisms in the No. 26 Hyprolap and several other machines for years. Interest in the promotion of this triangular-shaft



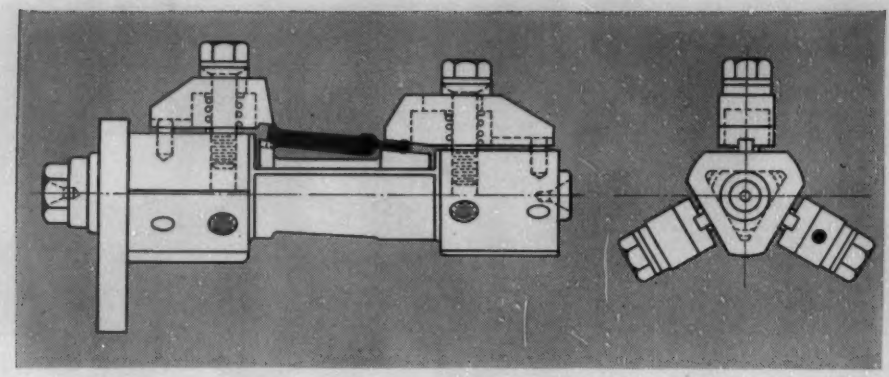
A SPECIAL MOTOR-DRIVEN truing arrangement form dressed the grinding wheel as shown in perspective view. Section A-A indicates the contour ground on the buckets. They were ground three at a time in a work arbor mounted between centers

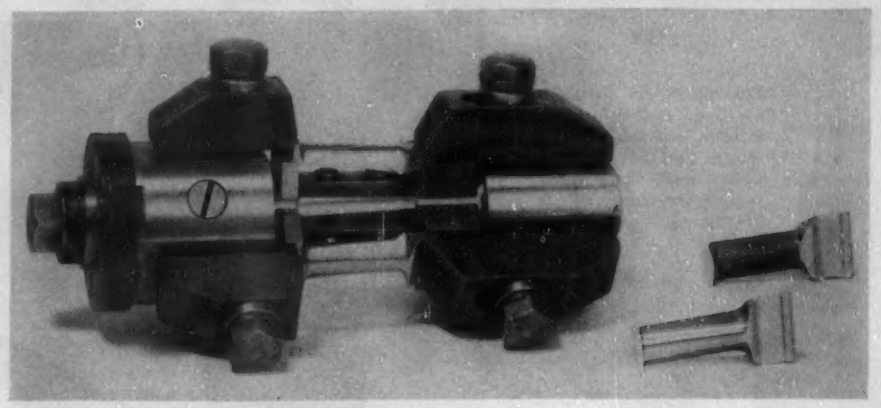


THE PRINCIPLE OF CAM GRINDING as illustrated here is essentially the same as those using a master cam mounted on the work spindle, except that the spindle is suspended from an overhead antifriction preloaded trunnion. Spring pressure holds master cam against roll, thus imparting the necessary rocking action to work spindle

drive came about many years ago when Everard Stubbs of Fellows Gear Shaper Co developed a design claimed superior to conventional drives using keys or splines. His claim was based on manufacturing costs and smoothness of operation of the tri-lobe shaft. In October, 1931, Mr Stubbs filed an application for a patent on the design of a triangular-shaped driveshaft sliding in a broached hole. In June, 1933, he was granted U S patent 1,912,412 and in June, 1950, after 17 years, this patent expired.

It was thought at the time that the automotive industry would be interested in this type of drive to replace splined shafts used in transmissions. Norton Co, who had worked with Mr Stubbs in the production of these tri-lobe shafts, had agreed to furnish the grinding equipment. The automotive industry, however, did not see sufficient advantages to warrant replacement of spline-machining equip-





WORK ARBOR nested three buckets which were plunge-ground to size between centers. Contour to be ground was not machined, thereby requiring a roughing grind removing 0.040 in. and a finishing grind removing 0.006 in. on diameter. Production rate for both cuts was 180 pieces per hr.

ment with cam grinders and the new tooling of broaching machines. However, both Norton and Fellows Gear Shaper Co adopted the tri-lobe driveshaft for certain mechanisms in some of their own machine tools, and they are still in use today.

Development of this design was prompted because single keyed shafts are limited in torque that can be transmitted without shearing, and multiple keys or splines, accurately made, are costly.

Although shapes which are possible to produce in standard cam-grinding equipment are almost unlimited, note that the Norton standard shapes are a combination of circles and tangent flats. This provides a section stronger than a true triangle because it more nearly approaches a circular form and also permits grinding at a very high rate of production. In addition, the tri-lobe contour has the functional advantage of allowing the driving members to be self-centering under all loads; thereby eliminating eccentricity problems associated with parts that rotate.

The female shape must be broached, but the broaches may be ground easily on the same equipment as the shafts. The main advantage in the use of these drives has been greater torsional strength and more easily attained accuracy.

Tri-lobe shafts are accurately and economically ground from the hardened blank. Accuracies of contour can be maintained within 0.0003 in.

On the whole, applications have been on new designs, except in one case in which lobed shafts replaced splined shafts purchased on the outside. Here the important consideration was that Norton had facilities for grinding tri-lobe shafts, whereas additional equipment would have had to be purchased for processing splined shafts.

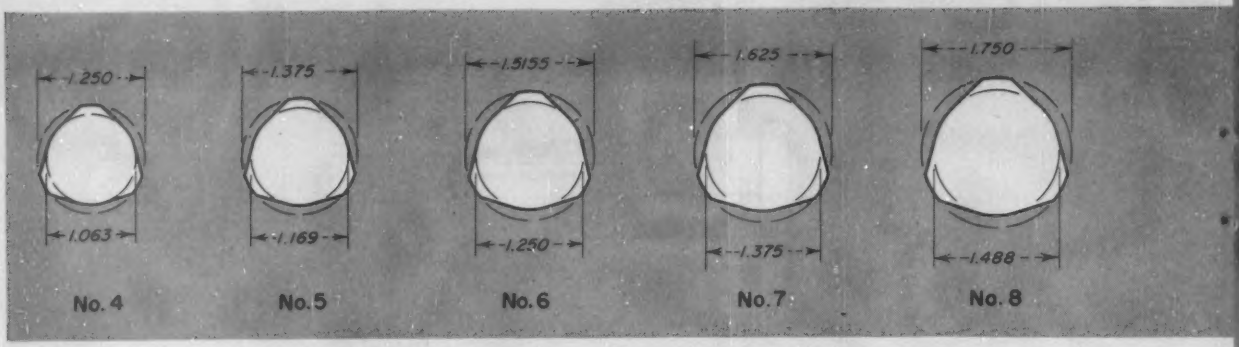
Here is another example of how a prominent machine-tool builder incorporated the tri-lobe driveshaft into the original design of a speed-change gearbox: The high- and low-speed sliding gears with tri-lobe holes are mounted on this shaft.

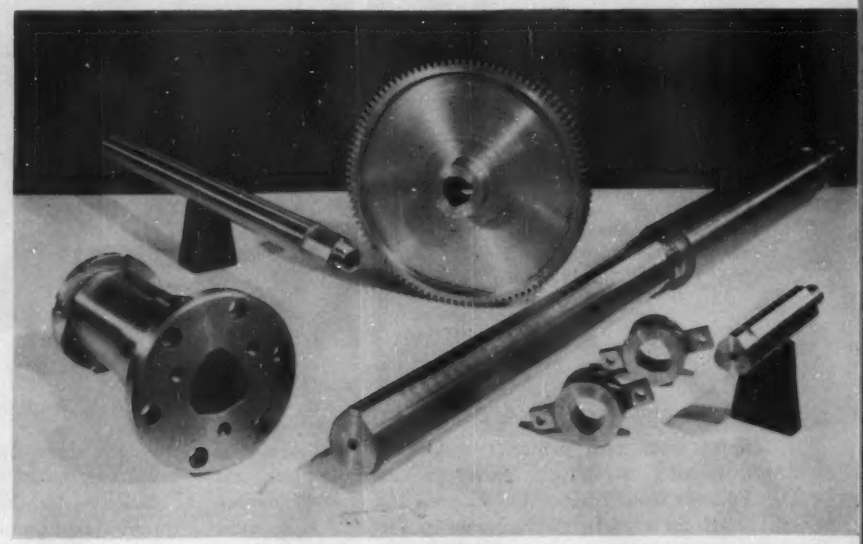
FABRICATING THE TRI-LOBE GEAR BLANK

Bore hole to 1.310-1.311 in. dia on turret
Heat-treat blank to R$_c$ 25-30
Rough and finish broach tri-lobe hole to go, no-go plug gage
Cut and shave gears from tri-lobe hole
Flame-harden teeth to min R$_c$ 57—max PD run-out limit after hardening, 0.002 in.

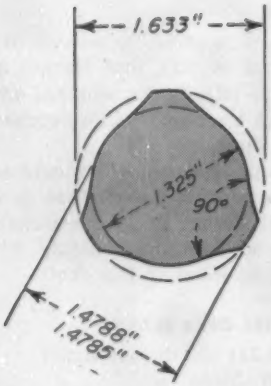
FABRICATING TRI-LOBE DRIVE SHAFT

Grind major dia of shaft 0.030-0.035 in. oversize
Rough-cut helical gear
Rough tri-lobe portion using form hob, leaving approx 0.030 in. stock
Normalize and heat-treat shaft to R$_c$ 37-42
Finish-grind tri-lobe on cam grinder to 1.4875-1.4788 dia
Finish-grind other cylindrical surfaces
Finish cut and shave gear teeth—max PD run-out limit after shaving, 0.001 in.

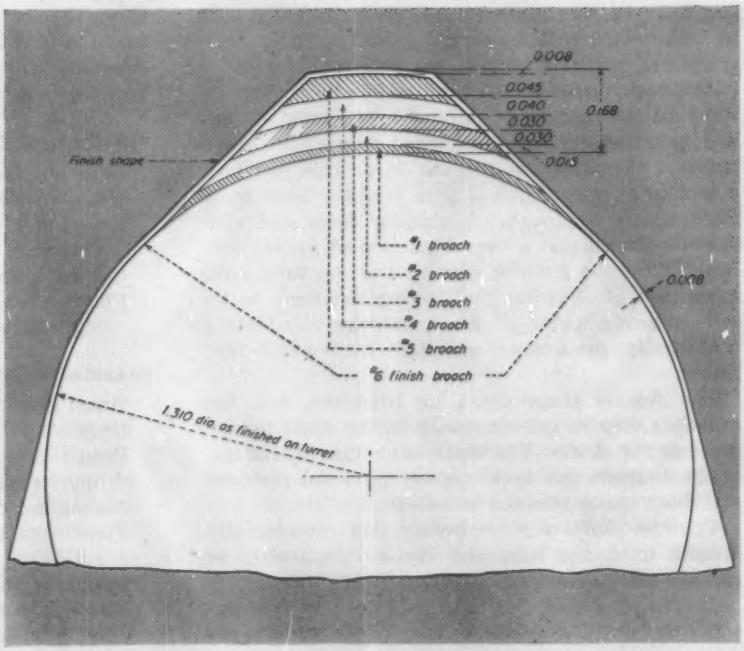




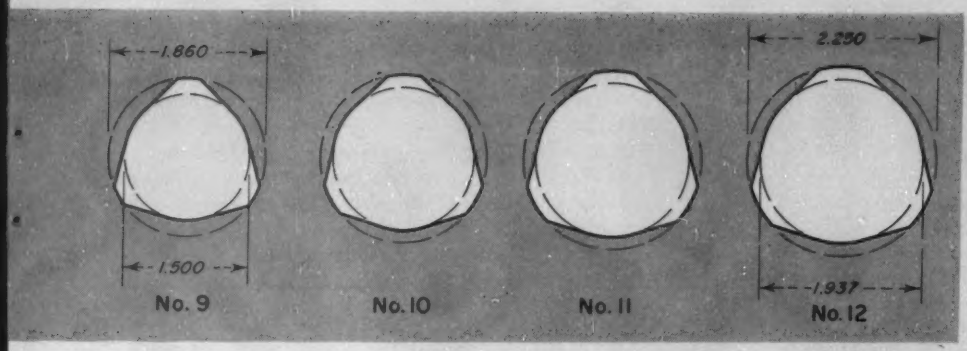
TRI-LOBE SHAFTS and mating parts used in Norton grinding and lapping machines. They comprise the upper spindle and drive quill, the driveshaft, and the breakup shaft and drive gear



AS THE TRI-LOBE section extends to within 3/16 in. of gear shoulder which is integral with shaft, there will be a short portion which cannot be roughed by hob. This portion of excess stock is removed on the cam grinder



TO BROACH THE FEMALE tri-lobe contour in sliding gear, five roughing broaches and one finishing broach are used. The finish broach is the only one which contacts all the way around. A new finish broach is ground to a given diameter that will produce a hole to a tight fit on the "No Go" plug. It is used until it produces a hole that is a tight fit on the "Go" plug

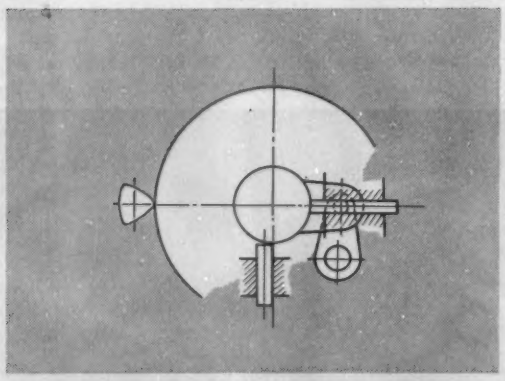


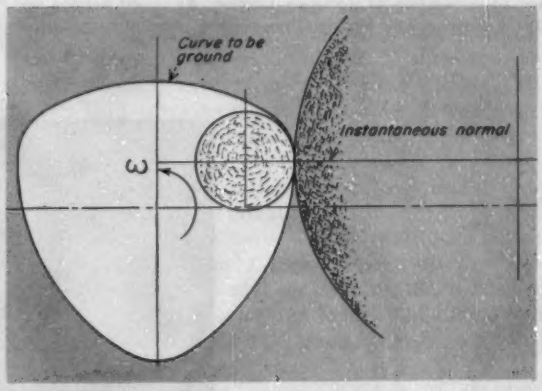
TRI-LOBE SHAPES and sizes of broached holes considered standard by Norton. A simpler form is being prepared, more economical to process and to gage accurately, which may eventually replace the present design

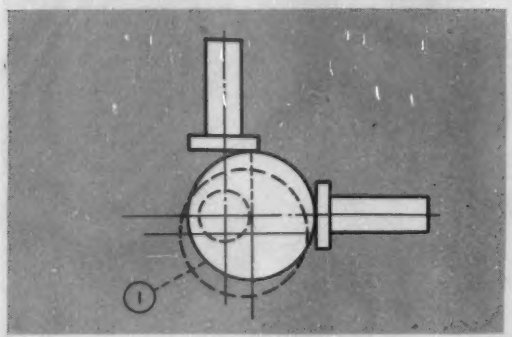
Contour grinding by a unique mechanism

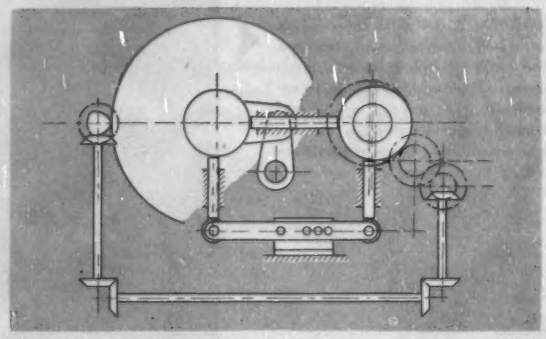
Now, again, investigations are being conducted by several automotive, aircraft, and machine-tool companies in the United States as to the validity of the triangle-polygon shape. These tests are being conducted to determine the advantages of this shape to replace splines, keyways, pins, and other couplings. It is known that this shape can be produced more accurately than the spline. The forces involved is the problem that the engineers are trying to answer. The triangle-polygon drive was used in German aircraft engines and machine tools during World War II, and in their automotive industry for more than ten years.

The French have developed a German machine capable of generating a variety of round and curvilinear profiles without special tooling. This grinder is limited to generating five basic forms, cylindrical, eccentric, triangular, square, and elliptical, at a constant angular speed. When desired, six- and eight-sided polygons can be generated. However, because of the geometrical principles incorporated in the machine, it is only possible to generate shapes which are a combination of radii. No flat areas, and

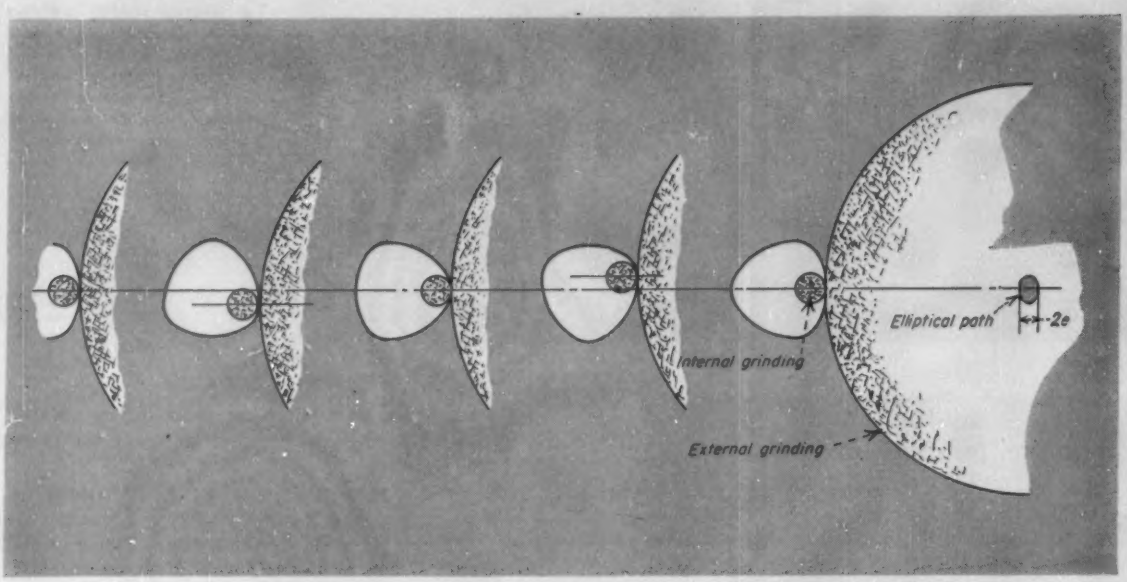




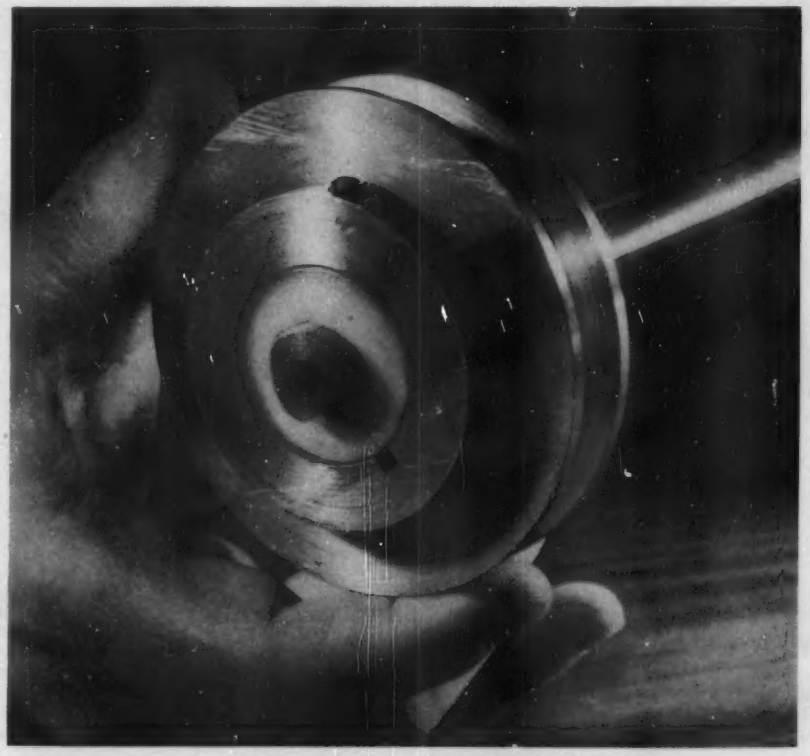




KNEE-ACTION SUSPENSION LINKAGE to the grinding wheel permits it to be moved about any position within a plane, thereby placing it at the instantaneous position of the normal of the curve. Although the grinding wheel is fixed to extent that its face would always move parallel to its center, which is necessary for correct duplication, it yet allows sufficient movement for the grinding-wheel axis to be displaced to any desired position within a plane. To accomplish the movement and support of the grinding wheel a horizontal and vertical pushrod is used. Workpiece is mounted between centers and free to rotate at any prescribed angular velocity



THE BASIC FEATURES of this mechanism can be best understood by taking a typical example of a workpiece setup. Once the mathematical equation of contour is defined, a dissection of this curve into x and y components is undertaken either mathematically or graphically. The values of these components are then fed independently into the mechanism, and move the horizontal and vertical push rods accordingly. This, together with the speed or time component of workpiece rotation, would place the grinding wheel in correct position, at correct time of workpiece rotation. By correct position and time is understood the placing of the grinding wheel at instantaneous normal of contour curve at the time when this instantaneous normal would become momentarily parallel to x axis. Therefore normal wheel wear is completely divorced from having any influence on contour, for both internal and external grinding. It is important to note that size of external grinding wheel can be of infinite variation, with only machine limitations governing selection. For grinding of reentrant angles, such as internal grinding, the grinding wheel must be smaller than smallest instantaneous radius occurring along contour of curve.



ORIGINAL ALUMINUM keyed guide for spindle drive was discarded and replaced with a tri-lobe molded-nylon guide. After guide is assembled into pulley, a shaving broach is passed through the tri-lobe contour to provide a consistent sliding fit on spindle driveshaft

no relief, can be provided in the circular surfaces. In other words, the surface is a continuous curve and does not permit grinding tangent flats. Furthermore, each of the polygonal shapes is equilateral in form.

The method of producing polygon shapes is unusual on this machine, and even more unusual is the accuracy to which it can hold straight or tapered contours, either external or internal. Obviously, grinding-wheel diameter does not affect size nor accuracy of the work. Polygonal shapes can be consistently and accurately reproduced to tolerances expected from precision cylindrical grinders currently available, and at costs showing high savings.

One obvious application is polygonal-contour male and female members for couplings, substituting for splines and keyways. This is partly because both the male and female members can be easily inspected with a micrometer or plug gage, while other shapes of coupling members require elaborate gaging equipment and tooling. Also polygonal members can be ground from the hardened blank, avoiding distortion and growth common in heat-treating conventional coupling members and drives. Current tests indicate that a polygon male-and-female joint can be produced in the same time it takes to grind the OD of the male spline, prior to cutting the spline. There seems to be little difference between the amount of work which goes into the broached female splined member and the ground female polygon member.

Economies result from the ability to produce new pieces rapidly and at minimum expense and time, and the operation is simple.

Generating principle

A gyratory motion has been designed into the grinding wheel axis by a mechanism built into the head. Motion of the wheel is controlled by an eccentric which imparts to the wheel axis two sinusoidal motions perpendicular to each other, through sliding members, two vertical and one horizontal, and additionally by a multiplying lever. Horizontal and vertical motion are directly controlled by the eccentric, and by the multiplying lever which gives four different ratios. Indexing from one ratio to another is through the four-speed change-gear box and a removable index pin in the multiplying device. Ratio 1:1, 1:2, 1:3, 1:4 generates eccentric, ellipse, triangle, or square profiles respectively.

The eccentric drive has two integral bushings, with their horizontal axis in line with the grinding-wheel spindle. Position of smaller bushing can be varied inside the larger one, resulting in a continuous variation of throw to the whole eccentric ranging from 0 to 0.315 in. Adjustment of throw is calibrated by a dial indicator set up at right angles to the grinding-wheel head.

Accuracy of the shape of external and internal polygonal-ground contours can be held to 0.0002 in. Gaging the accuracy of these profiles presents no problem because all lines passing through the workpiece center are identical diameters, thus permitting the use of conventional instruments used for checking circular work.

Here are case studies on polygon-drive production:

Alkon Products Corp. builds, as one of a line of machine tools, a high-production automatic drillhead. It was originally designed with a double-keyed spline spindle drive, piloted in an aluminum female guide. A pneumatic cylinder provided a reciprocating action to spindle of 60 cpm at a stroke of 4.214 in. Customer relations became very touchy as the in-line keys soon wore to a knife edge, setting up considerable backlash and chatter in the spindle drive, which in turn resulted in abnormal drill and tap breakage. The problem was to design a better spindle drive and still keep the machine competitively priced. Experience with present design indicated tooling, gaging, and fabrication of spline drives to be costly. Alkon heard of the tri-lobe shaft and decided to test its advantages. The new spindle was made of Nitralloy with the upper section a tri-lobe shaft ground to $0.3413 — ^{+.000}_{-.005}$ dia, surface finish 15-20 mu in. rms. Result: 40% reduction in manufacturing cost over previous spindle design, 60% increase in bearing surface, drill and tap breakage 40% below normal, maintenance and overhaul reduced 98%, and customer relations greatly improved.

A universal coupling manufactured by Kerns Manufacturing Corp features the tri-lobe contour in its driving members. This design produced a finer quality coupling, capable of a total 8° angular rotational displacement, at a lower cost, with a 15% higher load-carrying capacity, thereby permitting a heavier torque rotating load, in relation to its weight. Because of these features and the ease of manufacturing, the coupling is lighter and less costly than an equivalent spline coupling.

A precision-built clevis was originally tooled by Curtis-Wright for conventional general-purpose machines. They tried producing the same clevis in their polygon grinder with the net result that they saved 46 min per part or 766 days in one year.

We wish to acknowledge the assistance and cooperation extended by the following companies and individuals in the preparation of this article.

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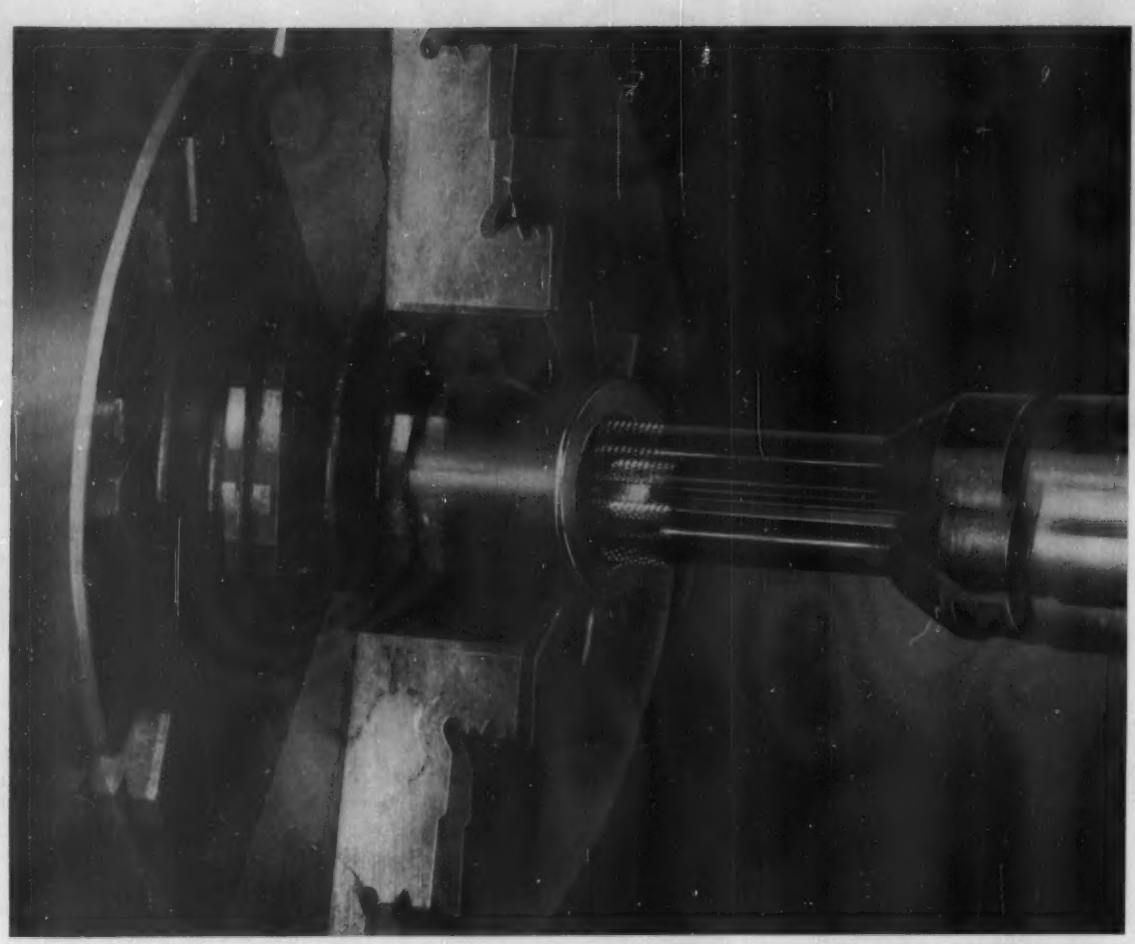
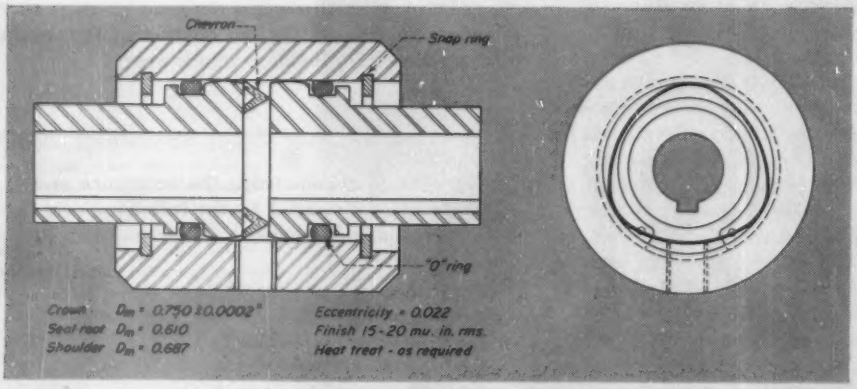
The Fellows Gear Shaper Co
The Heald Machine Co
Kerns Manufacturing Corp
Landis Tool Co
Norton Company
Professor H L Newport, Purdue University
S & S Machinery Co
Thorne Engineering Corp



GENERATING FEMALE MEMBER of coupling with a carbide bur mounted in internal quill of machine. Bur is ⅜ in. in dia and runs at 27,000 rpm. Length of bore is 1 in. and interference fit between male and female members is held to 0.0002 in.



UNIVERSAL COUPLING has tri-lobe shape on its driving members. Accurate profile on male members, which provide angular rotational displacement, is simultaneously form-ground as tri-lobe contour is generated by grinding wheel. Bearing contact of driving members is 85% of total displacement and grinding time is 1 min. per piece

In the design of their new race and passenger cars, the Thorne Engineering Corp has converted from the familiar involute spline torque coupling to a polygon coupling. Estimated tooling costs for the involute splines on their new model cars would have cost $3,340—as against the same work done polygonwise at a finished cost of $282. Thorne's experience to date with the polygon coupling drive has shown that it is 300% more efficient mechanically, and has a greater safety factor not possible with the conventional involute spline. It has further eliminated the need for keys, splines, and serrations.

MOTOR HOUSINGS are kept clean all through processing because of conveyors, special machines, and continuous chip and dust removal. Conveyor stores them temporarily as it moves them between machines. Roto-Clone collectors pick up cast-iron chips, feed them to overhead system that joins underfloor chip conveyor that also serves machines. Filters remove dust and oil from air, promoting a clean line with no later special washes for parts

Two refrigerators a minute with...

...special machines

...ingenious tooling

...automatic welding

...continuous chip disposal

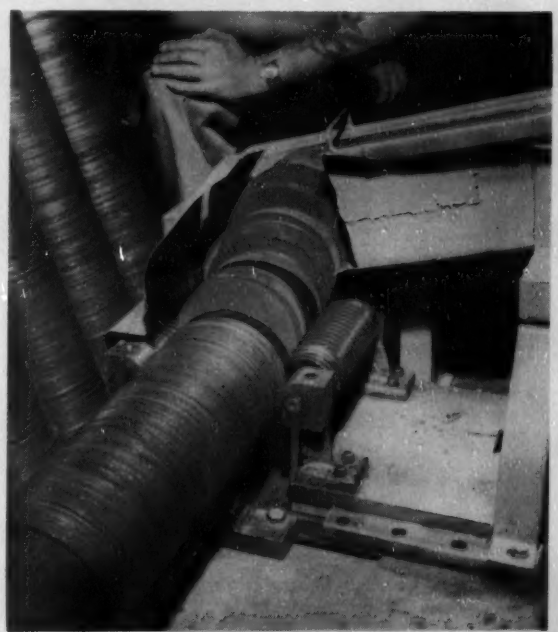
The new Westinghouse Electric appliance plant in Columbus, O, has 27 miles of conveyors that carry raw material from steel storage through processing to the shipping dock where freight cars are loaded with finished refrigerators. Here are pictures and captions that highlight some of the setups

GEORGE H DE GROAT, associate editor

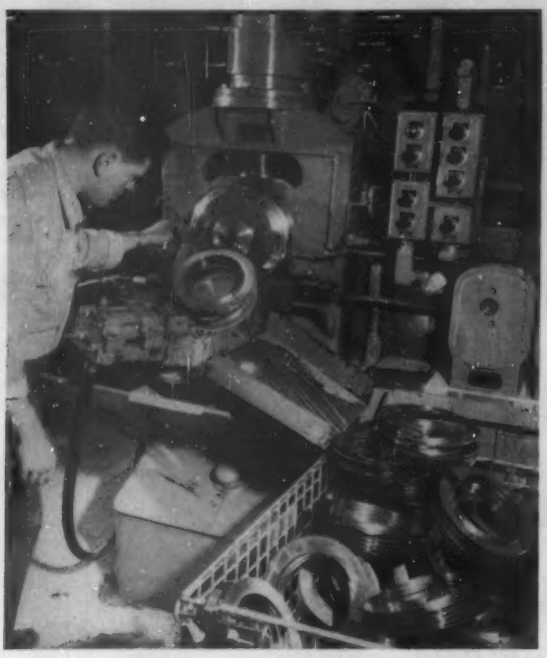
About 2600 production tools are working in nearly 2,000,000 sq ft of the new Westinghouse plant, all of them designed and adapted for fast production integrated with 51 separate conveyor systems.

This is a special-purpose factory, so each operation is highly mechanized and machines are special. One example, aside from those pictured, is the press line that forms the food compartment, or inner liner. Flat stock is passed from one press to another in tandem lineup. The first press pierces and embosses, second bends the edges up at 90°, third forms and sizes the final shape. Two operators work at the last press, alternately unloading the die and placing the work in a Yoder bender that forms the sides of the unit.

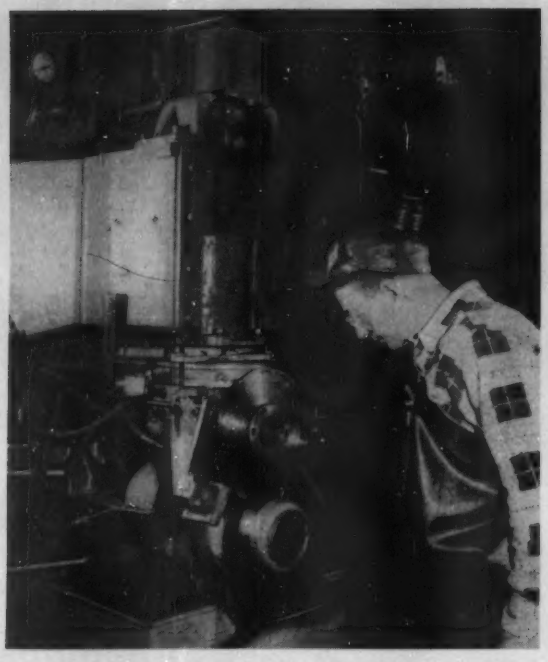
The machining section shows good, modern practice. Cast-iron motor housings are machined in tools equipped with blowers that carry away dust and



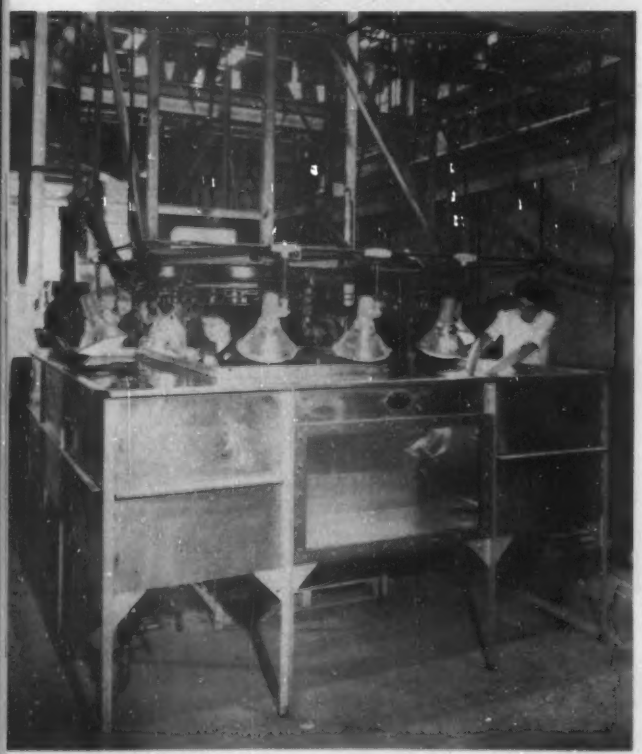
AUTOMATIC STACKER takes motor-lamination blanks fed to it by chute, rejects damaged disks to pan, and passes through blanks that can maintain tangent contact. Original stock is high-silicon electrical steel, fed from coil to 150-ton Clearing press that stamps 6 blanks per stroke, 82 strokes per min. Blanks are 0.028 in. thick, 6 in. dia. Passed blanks are screw-fed into vertical position, and held on two bars



SPECIAL TOOLING ON COLD-FORMING MACHINE bends cold-rolled-steel strip into coils with 90° bend close to one edge, on inside of the curve. Six rolls form spiral with thinned outer web by exerting pressure on stock. Stock is fed to Kane & Roach machine by double power reels—one head indexes 180° into feed position when other empties. Coils are cut off by flying shear



SEAM WELDER SPOTWELDS COOLING FINS (formed in previous photo) to compressor shell, avoiding distortions. Electrode roll is aligned to match fin helix, and is fired by ignitron sequence timing to control spot spacing. Automatic cycle time of 45 sec lets one operator feed two machines by assembling fins and shells, loading, unloading, and placing assemblies on conveyor that takes them to next operation



dirt, making it a clean shop. New Britain chucking machines do the rough machining, Kingsburys the drilling and tapping, and Cincinnatis, La Pointes, and Americans handle broaching. Boring is on Heald and Ex-Cell-O units. An important design point is that the housing bore is designed to form the bearing for the motor shaft. No separate bearings are necessary because the close-grain, high-strength cast iron provides a good bearing surface in itself, although some machinability is sacrificed to gain this advantage.

Single-spindle Brown & Sharpes with live tailstocks cut wrist pins. Chamfering and cutoff are done without producing a burr because the tool is off center and the work is fed through the hollow center of the tailstock, falling out chip-free. Acme-Gridleys

NO LEAKS IN WELDED PUMP-HEAD ASSEMBLIES are allowed up to 200 psi (dry air). Work is submerged to test seal of shielded-arc-welded seams, projection-welded terminal bushings, and brazed tubes

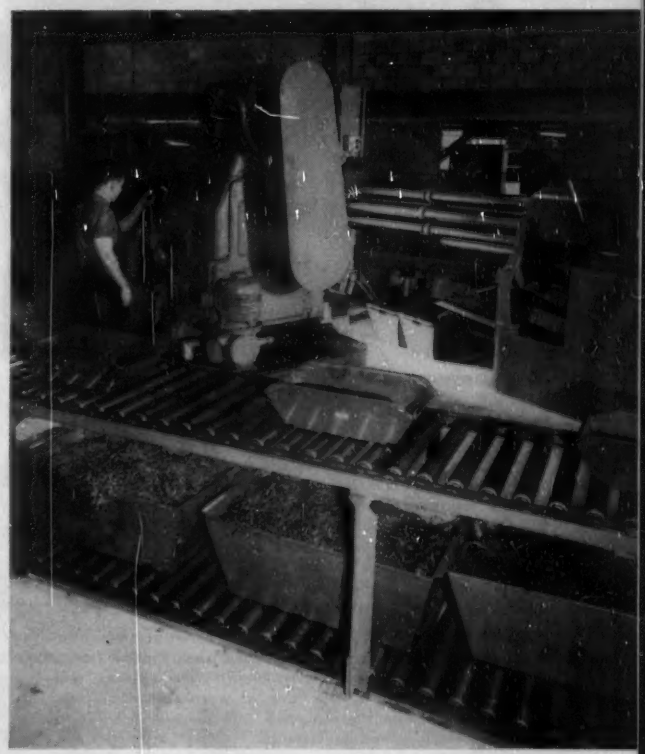
GUIDE PINS AND ELECTROMAGNETS locate top and bottom sections of food compartment in special 6-roll machine built by Resistance Welder Corp. Wrap-around piece that forms sides and back is also loaded, then machine automatically welds up seams to complete open-front unit. Operator only loads 3 pieces, then unloads assembly and places it on conveyor. Overhead conveyor carries it to degreasing and pickling machine

AUTOMATIC POSITIONERS were specially built for holding pump heads during inert-gas-shielded welding. Air chuck has fingers that catch open shell end and close chuck jaws. Power, wire feed, and gas shield are started automatically, and work is rotated slightly more than 360° as 31 in. of circumferential weld is made. Total conveyor-to-conveyor time is 30 sec, including clamping, welding, releasing, and shutoff

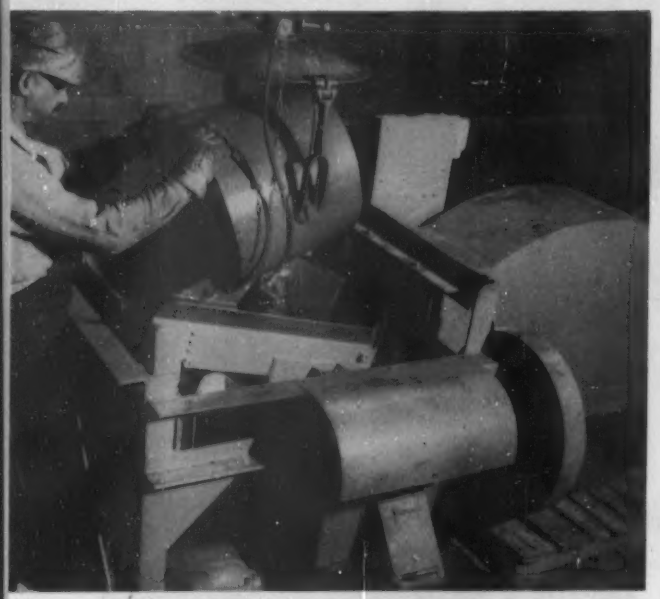
in a battery make small parts. All of these machines have conveyorized chip removal, and are tooled to minimize attendance and maintenance.

In final assembly, a refrigerator cabinet is placed on a wooden pallet that serves as a shipping-carton base, too. A powered floor conveyor moves the unit along as weld seams are sprayed with wax over a plastic coat to make the cabinet airtight. Glass-wool insulation is placed, and the food compartment assembled. Then evaporator-tube openings are sealed, moldings are placed, and control unit and light switch are added. Leak tests are made under 4 in. of vacuum along the line.

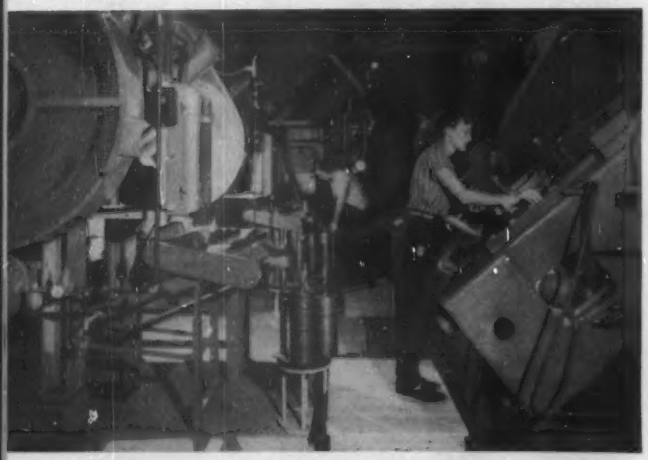
A tunnel of light helps check surface finish for blemishes and color, and after final inspection the unit is crated and shipped.



LINE OF SCREW MACHINES turns out pump pistons, piston screws, control plungers, and other small parts for refrigerators. Conveyors in beds of the 6-spindle Acme-Gridleys move chips and work together to oil-tight pans, allowing oil to drain to sump as they index. Pans are shifted to lower roller conveyor (foreground) that takes them to chip-disposal area



CHIPS, WORK, AND OIL ARE SEPARATED at end of screw-machine line, where pans are dumped into shaker-blower that separates work from chips. De Laval separators extract oil, and chips are loaded into gondolas for shipment. Oil is reclaimed by purifiers, and work is replaced in pans and carried on upper roller conveyor back to far end of line for more operations



TANDEM PRESSES, A, B, AND C, produce rotors and stators from 6-in. blanks. "A" press (left) is magazine fed, pierces holes and slots, and is equipped with conveyor that brings work out back, dropping it on 4-spindle stacking rack. Operator at "B" press feeds blanks into compound die that completes stators and cuts out rotor section. Stator is ejected by pin into tote pan; rotor sticks to punch, is stripped by upper knockout that drops it on conveyor leading to magazine in "C" press. Escapement on conveyor is controlled by "C" press so only one rotor blank is fed at a time to be trimmed. Scrap is delivered underfloor, including that sheared off punch at "C"

HIGH-MOVING CONVEYOR carries crated refrigerators from final-assembly area to warehouse and shipping-dock area, over offices and main aisles. Elevator lifts them up here, and another lowers them to floor level at warehouse. Floor conveyors in warehouse are equipped with photoelectric circuits that route crates to railroad sidings.

BREAKING OPERATIONS DOWN to the simplest possible degree insures steady flow in assembling 5 different models. Buildup from side frames to tested machine is progressive along two main lines of 70 stations each

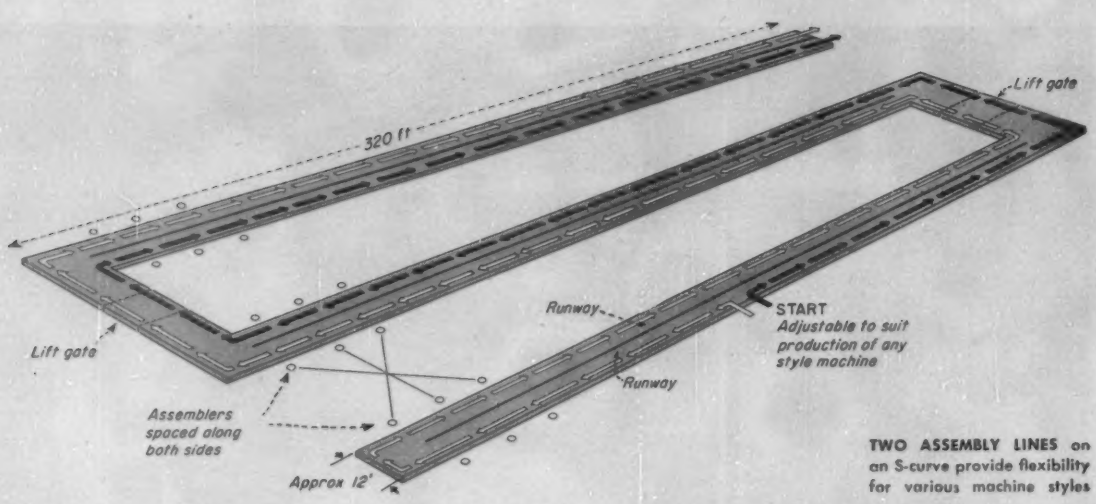
How to Simplify Assembly of Complicated Machines

In-line final assembly, accurate subassembles, and ingenious tooling have jumped production of "Sensimatic" bookkeeping machines at Burroughs Corp, Plymouth, Mich

More than 7,000 parts go into the "Sensimatic," a complex bookkeeping machine that automatically positions the machine carriage for posting accounting forms by means of the "sensing" action of mechanical controls. Five different types of Sensimatics are made at Burroughs; all, however, run through the same final-assembly lines. Each type contains around 120 sub-assemblies which go together to make up 9 major sub-assemblies. These are put together on lines adjoining main final assembly and are completely tested and adjusted before delivery there. A high degree of accuracy is essential in subassembly. For example, as close as ± .00025 are held in the register section where pinions must be in full engagement with racks.

New tooling, simplified operations and on-the-line inspection have cooperated toward increasing output so that, at present, production is nearly 50% higher than it was prior to installation of the new assembly line in August, 1953. Final-assembly lines are made up of six 320-ft-long tracks divided into two flow patterns for different classes of sensimatics. Each line contains 70 stations so machines are built up progressively as they move along. At each station, a particular stage of assembly is performed in a time unit of 15 min so 32 complete units are produced per 8-hr day. Assembly operations are broken down to what can be done in 15 min to simplify work and maintain a steady, uninterrupted flow. Toward the end of the line, however, where machines are nearly complete, operations require more than 15 min, therefore two complete units are expected on 4-hr jobs, 8 for 1-hr jobs, and so on. Production balance is maintained by scheduling simple and faster operations according to various types and models required.

A special card system insures a constant supply of small parts going exactly to the station in the line where they are needed. Sub-



TWO ASSEMBLY LINES on an S-curve provide flexibility for various machine styles

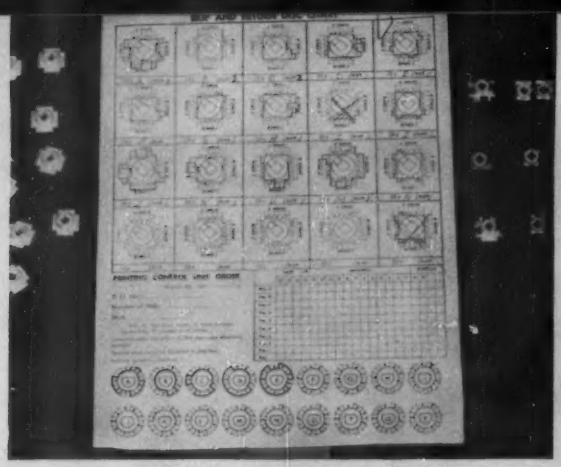
assemblies are handled in the same manner and stored in racks opposite proper stations. An operation sheet at each station covers the specific job to be done. Outline includes parts list, sequence of operations, method of assembly, and function of part for checking. Standard equipment in the lines includes dollies at each station that support work and permit easy turning and positioning.

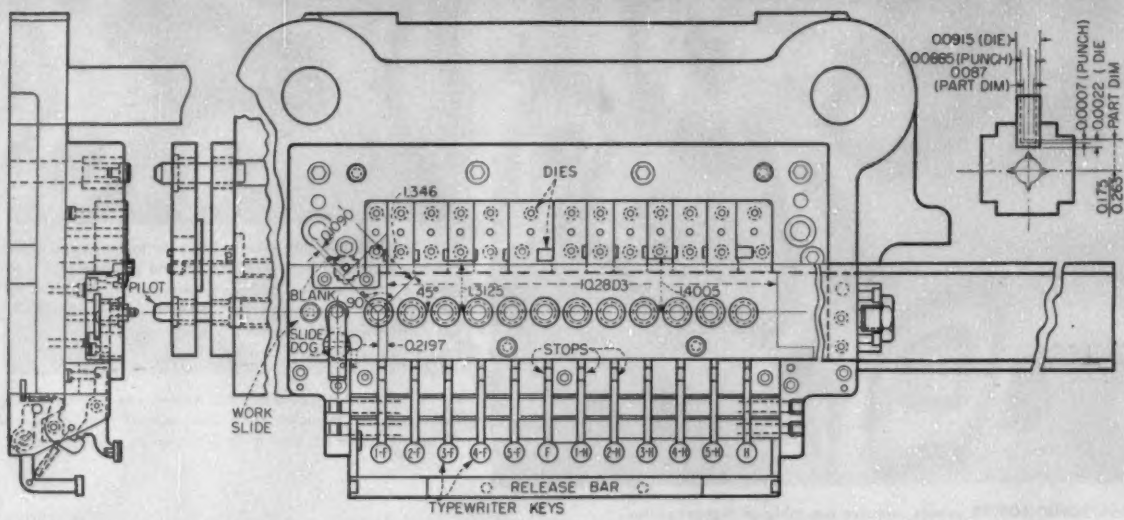
Exhaustive tests and adjustments are an important part of assembly-line procedure. Most comprehensive testing is performed when machines are complete except for cases, left off to facilitate adjustments. These are "combination tests" involving the posting of various combinations of figures that require the use of all registers. Average time for this complex operation is 3½ hr and may run as high as 4, or 5 if numerous adjustments are needed. Sample postings from these tests accompany machines along the line to other tests, then on to final inspection. Before leaving final assembly, standard accounting forms are posted to insure columnar accuracy of the machine. Forms were developed to make use of every accumulator in the machine and by having predetermined totals, lengthy calculations and retesting are eliminated. After passing all tests, cases are put on and the machines are sent to final inspection where operators run them as they will be run in actual use. Standard accounting forms previously posted are used here also, but in this setup, they are posted twice.

PRECISION SUBASSEMBLIES ARE BUILT UP WITH INGENIOUS TOOLS & SPECIAL FIXTURES

DIAGRAMS SIMPLIFY SUBASSEMBLY of carriage control panel, heart of the "Sensimatic". Here, sensing pins are assembled in magazines and placed in panel according to diagram of required carriage movements

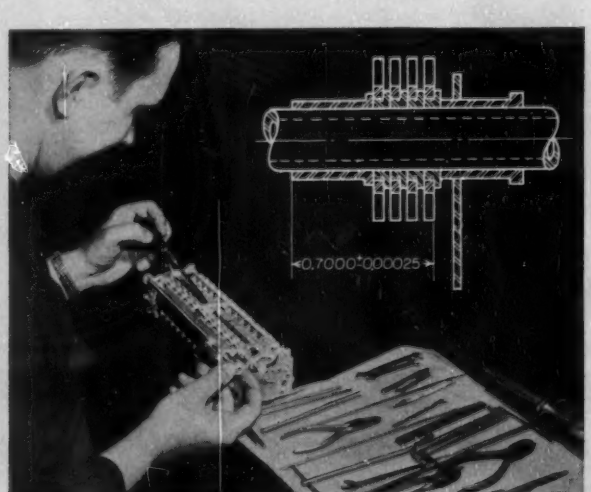
FINAL ADJUSTMENTS are made on control panel before delivery to final-assembly lines. Stop dogs and disks control columnar alignment of carriage and are assembled according to chart laid out to provide carriage movements according to customer needs





TYPEWRITER DIE IN SUB-ASSEMBLY LINE trims standard blanks into an infinite variety of shapes to make disks for panels. Blank is loaded outside of ram on an air-operated work slide. Operator depresses keys aligned with dies in accordance with chart that indicates type of disk required. Keys set stops that engage a dog on the slide as it is pulled under ram by an air cylinder. This positions the blank at specific dies for trimming edges to required shape. Release bar returns keyboard to inactive position after last trim has been made and air cylinder returns work slide to load position at left. Blank is turned on locating stud for second pass when trimming is required on portions not originally aligned with die

ALIGNMENT FIXTURE aids assembly of register section of machine. Numerous parts of this subassembly are made to close tolerances and must be assembled to same high degree of accuracy for perfect functioning of machine. Fixture simplifies work so operator has only to load parts and assemble them



PLUS OR MINUS 0.00025 is held over 0.700-in. length of each group of 4 pinions in register assembly. There are 12 such groups and 0.003 is held over 8.400-in. total length. Bushings on which gears fit are selectively assembled to hold these tolerances. Here, final adjustments are made to register before delivery to final assembly lines

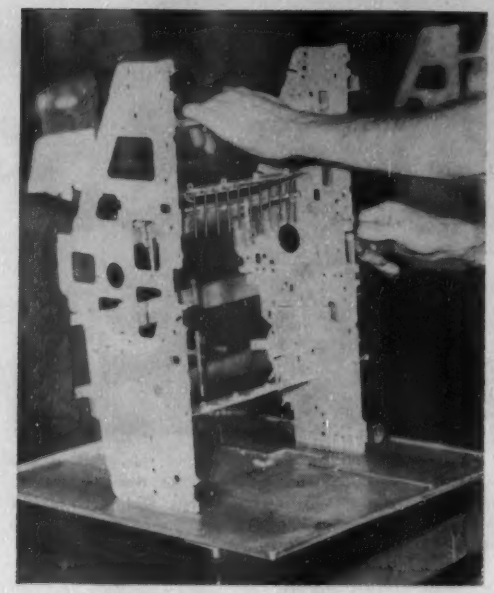
ELECTRONIC SORTER speeds selective assembly of register-pinion bushings. Parts are automatically fed from Syntron vibrator and hopper to nets in rotary table where they are carried under head in electronic selector. As each part contacts and exerts a slight pressure on the head, a coil excites current that varies with pressure. Current is registered on an ammeter graduated in increments of ten millionths in. so that wide sweep of the needle indicates length of bushing, which is held within 0.0001. Precisely the same current returns to selector and actuates one of three solenoids set to operate only on current produced by pressure of parts that are oversize and undersize within 0.0001 as well as parts on mean dimension. Solenoids operate traps under rotary table to drop parts in one of three pans, depending on thickness

BALL SOCKET FIXTURE allows operator to move carriage-drive unit, or gearbox, into any desired position and lock it there for inspection and final adjustment. Freedom to make careful adjustments in hard-to-reach places simplifies and speeds this operator's work

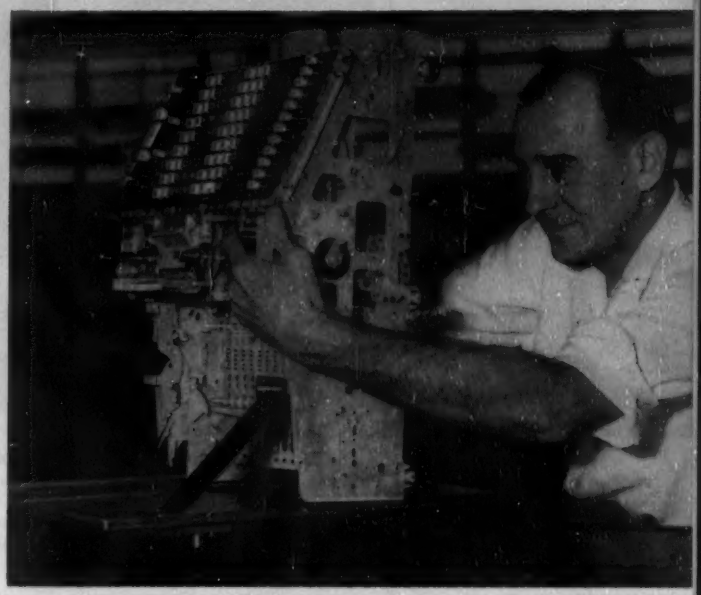
SUBASSEMBLIES . . . continued

FINAL ADJUSTMENTS ARE MADE on gear cluster which transmits motion of horizontal rack to vertical type bar. Like other subassemblies, this one is 100% inspected before it reaches final-assembly lines

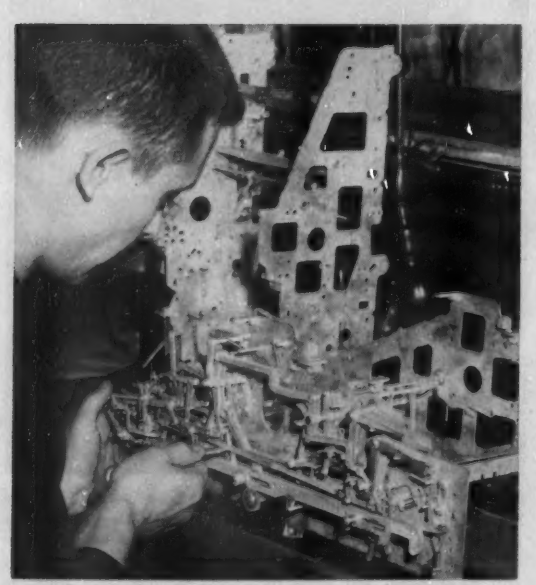
COMPLETE SUBASSEMBLIES, FIXTURES, OPERATION SHEETS AND STATION-TO-STATION PROGRESS SIMPLIFY FINAL ASSEMBLY



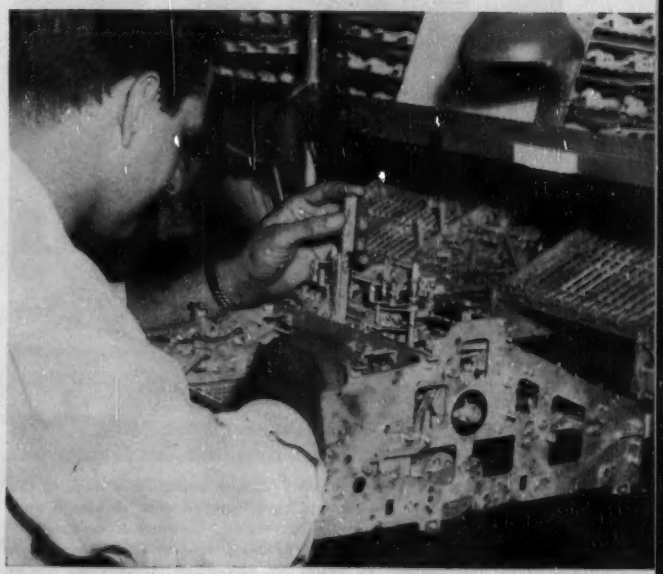
SIDE FRAMES are among first parts to go together in final assembly of "Sensimatics". Time allowed for this operation is 15 min, so operator completes 32 units in one 8-hr shift



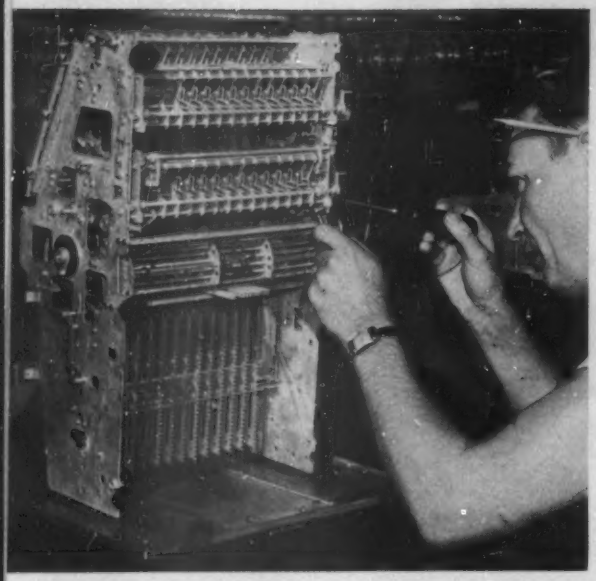
ROTATING DOLLY supports work and permits operator to get at hard-to-reach places without lifting or pulling. When not in use, dolly is slipped off stud in bench and placed in runway



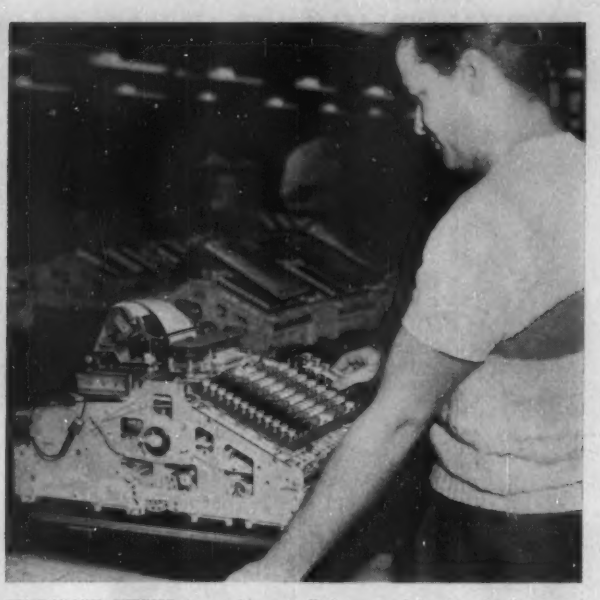
OPERATORS AT EACH STATION contribute to final assembly as machine is gradually built up. Here, a section put together on a subassembly line is added to the right-hand frame of a machine



PERFECT ALIGNMENT IS REQUIRED in assembling type bars. Machine is well along assembly line at this point, has cluster gear section and hammer section. Operator, like others, works from operation sheet that outlines parts required, sequence and method of assembly and function of part



"FOOT-REST" FIXTURE simplifies assembly at under-side of machine, permits operator to use both hands in making adjustments to accumulator and register. Fixture is simply angle strap resting on dolly at one end and fastened at the other to a pad later used for assembling carriage to machine



TEMPORARY FIXTURE is quickly installed in machine for checking and adjusting type. Operator posts all numbers, checks mathematical accuracy and inspects tape for uneven type impressions. Old ribbon is used for this test to insure discovery of uneven type; new ribbon tends to produce sharp, clear characters regardless of type

COMPLICATED ASSEMBLY SIMPLIFIED ... concluded

LAST STAGES OF FINAL ASSEMBLY include adjusting carriage to the machine. Keyboard has already been installed and machine is now ready for extensive assembly-line testing, in which "Combination" tests prove accurate functioning. By using standard forms from which different combinations of figures are posted, all registers are put to work, results are checked with precalculated totals. "Sensimatic" panels built for customer are not installed during this test, except upon specific request: instead, standard panels are used to make test more comprehensive. Custom-built panels do not always use every part of the machine

LAST OPERATION is assembly of cases. At this stage, machine has passed combination test as well as additional test runs where sample postings are made from standard forms to check columnar accuracy. All tests are designed to check functioning of every part of machine, and forms developed for this work eliminate haphazard running, retesting and lengthy calculations in the line

Round Table

Gossiping Wives

"What should I do about gripes I hear through the bridge club, Ed?"

"Probably just forget them, Al. What did you hear?"

"Well, evidentally one of the men is down on me, and his wife has been hearing about it too much. Last time my wife went to the bridge party, the other guy's wife had a cocktail and really let go. Claimed her man was being mistreated, and said she'd know what to tell me."

"Why not just forget it, Al. If the guy can't work up enough nerve to complain to you directly, then it must not be a bad enough grievance for you to worry about."

"But my wife takes a beating at a party like that. She has to defend me, I suppose, but she doesn't want to get into a fight."

"That's the risk she takes when you're a foreman, Al. Why not get her to switch to another bridge club, where none of the women are wives of any of your workers,"

"I suggested that, but she likes the bunch and thinks I should do something about the problem."

"Seems to me she's wrong, Al. It's not her business to tell you what to do, any more than it's the business of the other wife. Let the guy tell you direct."

"But he won't do it, Ed. That leaves me with a secret gripe that I can't really go talk to him about. Or maybe I should."

"Better not, Al. That would admit to him that you place too much importance on women's talk; and whether or not it is important, some men don't like to think so."

"As it is, my wife will probably get mad at me for letting the situation go on like this."

"She shouldn't, Al. Tell her that's the price she pays for being married to a foreman. She likes the extra paycheck fine, I'll bet. This is just one of the disadvantages that balances the scale."

"You ever try to tell a woman to mind her own business, Ed?"

"Not often, Al. But maybe you have to do it in this case."

***CAN AL** afford to talk to the man with the gripe? Or must he wait until the man comes to him? How can he help his wife in her embarrassing spot? Your ideas on the subject may help others in the same position. Discussions of earlier topics appear on later pages.*

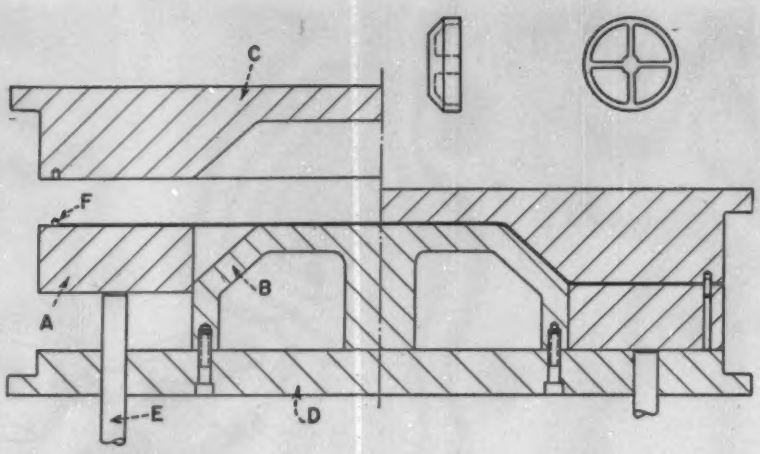


FIG. 1 . . . First-operation die for a tapered shell draws the piece slightly oversize, so that the metal will not be strained at the corners when the radii are subsequently reduced

Cope Talks on Draw Dies...XII

Tapered shells require skillful

We gave you the six rules for drawing tapered shells (AM — April 26, 1954, p114), and how to design dies for some of these rules. Now, we will show you the application of the remaining rules and how preliminary shells are laid out

Two, large cast-iron dies for drawing, stamping, and flanging a tapered shell are shown in Figs. 1 and 2. In the first die the body of the shell is drawn with larger drawing and bottom radii than the finished shell, in order to make metal draw more readily and to prevent fractures. The shell is drawn slightly oversize so that the metal will "lay in" and not be strained in the corners when the radii are reduced in the second operation.

The first-operation die consists of draw ring *A*, punch *B*, die *C*, punchholder *D*, pressure pins *E*, and gage pins *F*. Open and closed views of the die are shown in Fig. 1. Punch *B* is cored at four places to reduce its weight. No knockout is required in die *C* because of the shape of the stamping.

The second-operation die, Fig. 2, consists of pressure pad *A*, punch *B*, die *C*, and pressure pins *D*. The shell is located over the center form of the pressure pad, which is normally held in the position shown at the left of the centerline. When punch *B* descends, it stamps the center portion of the shell while the pad is in its raised position, and then forces the pad down to form the flange. A tapped hole is provided in the center of the pad for remov-

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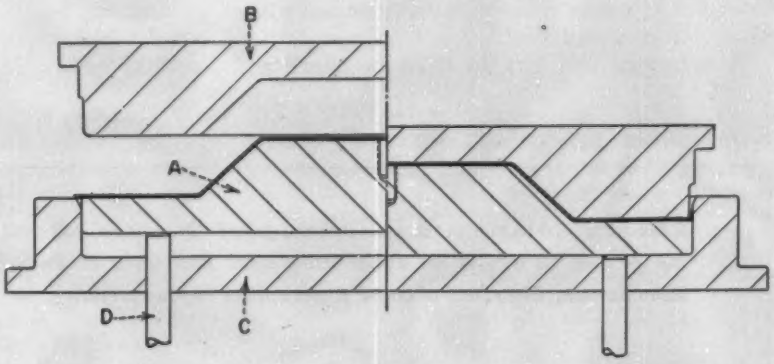


FIG. 2 . . . In the second-operation die, the shell is located over the center form of the pressure pad, and the body is stamped to size and the flange is formed

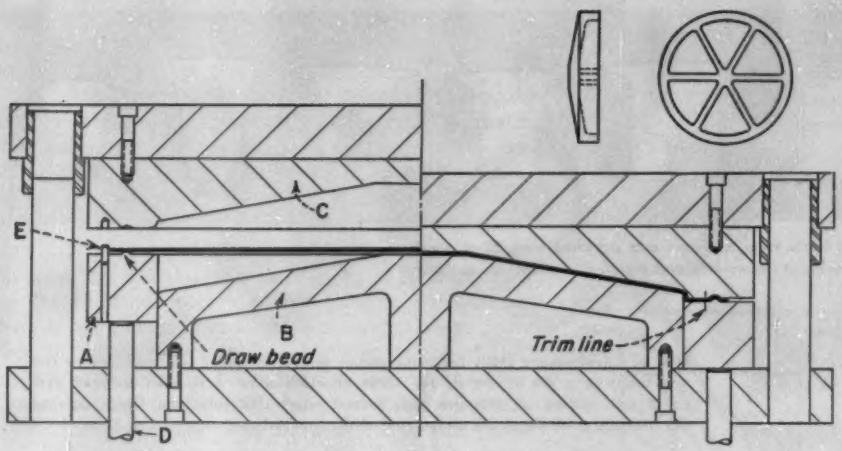


FIG. 3... Because of the narrow flange, a bend is stamped on the blank while the pressure pad is up (left), then the shell is drawn and flanged (right), as seen at bottom of the stroke

operation layout

STANLEY R COPE, president
ACME SCHOOL OF DIE DESIGN ENGINEERING,
SOUTH BEND 1, INDIANA

ing the pad when the die is to be removed from the press.

A die for drawing a large, shallow shell with a long taper (Rule No. 4) is shown in Fig. 3. This die is similar to that shown in Fig. 1, except that a draw bead is provided because the shell flange is narrow. Its area is not sufficient to hold the blank and prevent metal from flowing in too quickly. Hence, additional stock is allowed on the blank outside the trim line for the draw bead.

This draw bead is stamped in the blank while the pressure pad is in its up position, as shown at the left of the centerline. When the bead has been stamped, the pressure pad is forced down and the metal flows over the draw bead into the body of the shell. At the end of the stroke the die assumes the position shown at the right of the centerline.

The die consists of pressure pad *A*, punch *B* cored to reduce its weight, die *C*, pressure pins *D*, and gage pins *E*. These details are mounted in a standard semi-steel, center-post dieset. Guide posts are necessary because of the draw beads. The punch and die are arranged to strike the stamping all over to flatten any waves that may have formed during drawing.

First-operation shells are not always drawn to the shape shown in Fig. 2. If the shell is very shallow, the taper may be stamped from a plain cylindrical shell, as shown in Fig. 4. The diameter of the cylindrical shell should be approximately equal to the diameter of the final shell, measured at a point halfway up the tapered body. Deeper shells should be drawn to the shape shown in Fig. 5 prior to the stamping operation.

DEEP-TAPERED SHELLS

Deep-tapered shells are ordinarily produced by preliminary reductions and then stretching the shells to shape and size. A plain, stepped shell with cylindrical side walls is first drawn with two or more diameters, depending upon the size of the shell and the amount of taper. This shell is then placed in

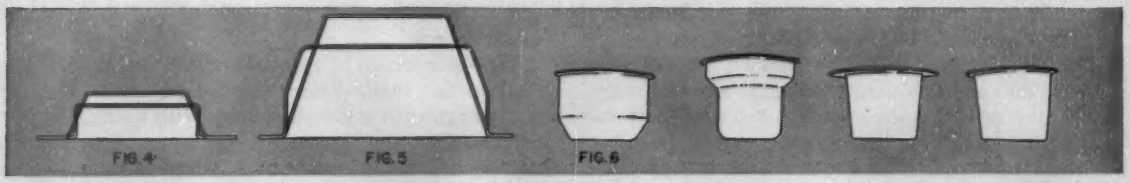


FIG. 4... Plain cylindrical shell may be stretched to a shallow tapered shell. FIG 5 . . . Preliminary shell for a deeper tapered shell. FIG. 6 . . . Sequence for making a drinking-cup holder. FIG. 7 . . . A goblet is made in three operations

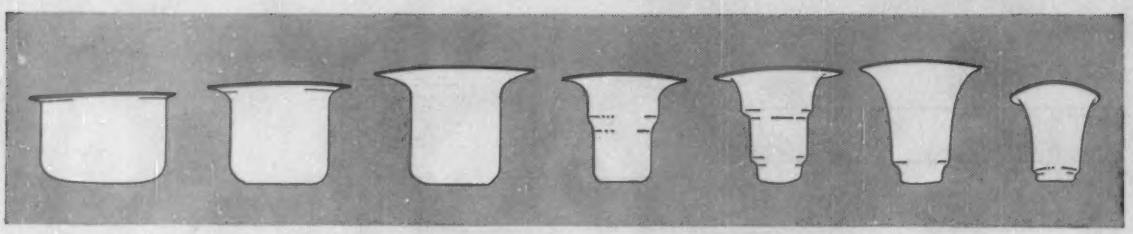


FIG. 8 . . . A reflector for an indirect table lamp is drawn and stretched from 22-ga steel in six operations; then trimmed and curled in the seventh and eighth operations, respectively

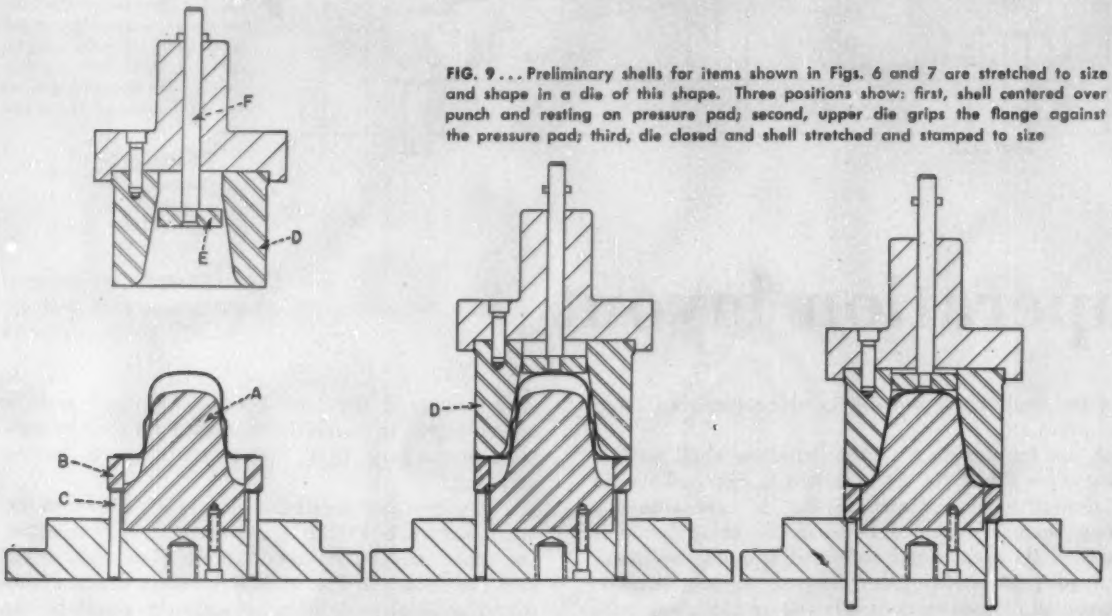


FIG. 9 . . . Preliminary shells for items shown in Figs. 6 and 7 are stretched to size and shape in a die of this shape. Three positions show: first, shell centered over punch and resting on pressure pad; second, upper die grips the flange against the pressure pad; third, die closed and shell stretched and stamped to size

a stretching die and stretched and stamped to final size and shape. Either single-action or double-action dies may be used. Double-action dies are preferable for stretching large work because it is necessary to clamp the flange tightly while the shell is being stretched, to prevent excess metal from being pulled into the body of the shell.

Figs. 6, 7 and 8 show the sequence of operations for making three different tapered shells.

The shell shown in Fig. 6 is a drinking-cup holder, which is drawn and stretched in three operations. It is then trimmed and curled in the fourth and fifth operations, respectively. The shell shown in Fig. 7 is a cocktail goblet, which is also drawn and stretched in three operations. These two shells are produced in single-action presses.

The preliminary shells are drawn in ordinary drawing dies and are then stretched to size and shape in dies similar to that shown in Fig. 9. Three positions of the die are shown. In the first, or open, position, the shell is centered over punch *A* and rests on pressure pad *B*. Normally, pad *B* is held in a raised position by pins *C*. In the second position, upper die *D* is shown gripping the flange against the pressure pad, just prior to forcing the pad down and stamping the shell. In the third position, the die is shown closed, with the shell stretched and stamped to size. At *E* and *F* are shown the knockout plate and rod in that order. These eject the shell in case it rises with upper die *D*.

The shell shown in Fig. 8 is a reflector for an indirect table lamp. The part is drawn and stretched from No. 22-gage steel in six operations. It is then trimmed and curled in the seventh and eighth operations, respectively. Because of its size the shell is stretched and stamped in a double-action press, using the die shown in Fig. 10. In the first, or open position, (not shown) the shell is centered in die *A* with the flange resting on top of the die. In the second position the flange is shown clamped by blank-holder *B*. In the third position the die is shown closed after punch *C* has stretched and stamped the shell to size.

The advantage of a double-action die of this type is that the blank-holder can be adjusted to clamp the flange with a vise-like grip. With a single-action die of the type shown in Fig. 9, pressure from a spring or air attachment must be relied upon to prevent pulling excess metal from the flange into the shell body. If this occurs the shell will wrinkle.

DESIGN OF PRELIMINARY SHELLS

A preliminary, or stepped, shell must be carefully laid out for correct size, shape, and just enough

metal to make the finished shell. Too much metal will cause the shell to wrinkle; too little causes breakage during the stretching operation.

The number of steps required to make the preliminary shell will depend on the size and the angle of taper. Generally speaking, the greater the angle of the taper the greater the number of steps necessary. For example, if the angle is small, as is true of the shells shown in Figs. 6 and 7, only one step is required. Also, only one step would be required to produce the shell shown in Fig. 8, if it were not for the reduced portion at the bottom. Because of the steeper angles, several steps are required to produce the shell shown in Fig. 11. The height of the various steps should be approximated by the designer; but the final heights must be found by trial.

Preliminary shells must have a flange for gripping purposes, and be placed in the die so they rest on the flange and have little or no side movement.

The arcs that join one portion of a shell to another should be large and blend perfectly; otherwise, circles and other marks will appear.

Great care is required in selection of materials for producing tapered shells that are to be stretched to size and shape in a final operation. Only extra-deep-drawing stock can be used.

An alternate method of producing deep, tapered shells, sometimes used in preference to stretching, is shown in Fig. 12. A plain shell is blanked and drawn in a combination die, then drawn into a shell with the desired taper by a series of redrawing dies. Each of these dies forms a small portion of the taper. The shell is then stamped in a final operation. This operation sizes and removes marks.

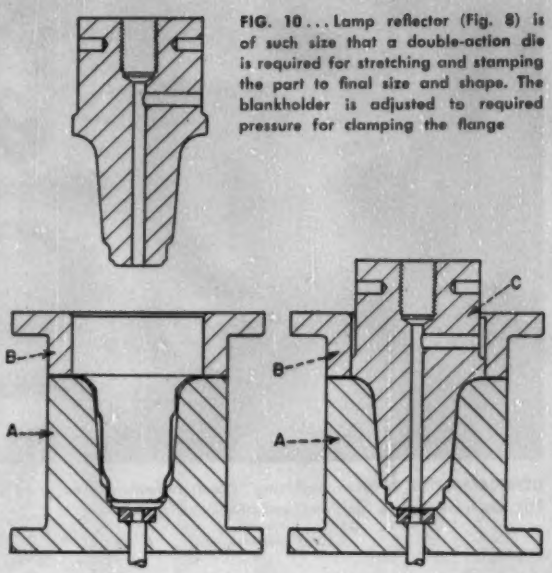


FIG. 10 . . . Lamp reflector (Fig. 8) is of such size that a double-action die is required for stretching and stamping the part to final size and shape. The blankholder is adjusted to required pressure for clamping the flange

REVERSE DRAWING OF TAPERED SHELLS

Some types of tapered shells, particularly large shells with pointed bottoms, such as automobile headlamps and similar articles, are usually made by reverse drawing. A plain shell is first drawn and is then partially turned inside out. The inner shell is then reduced to the necessary shape prior to the stretching and finishing operation. During these operations the outer shell prevents excess metal from flowing into the body of the shell and causing wrinkles. The tapered portion of the shell is then stretched and stamped, and the remaining portion of the outer shell is drawn into the body of the shell in the finishing die.

Part XIII of Mr. Cope's series will appear in an early number.

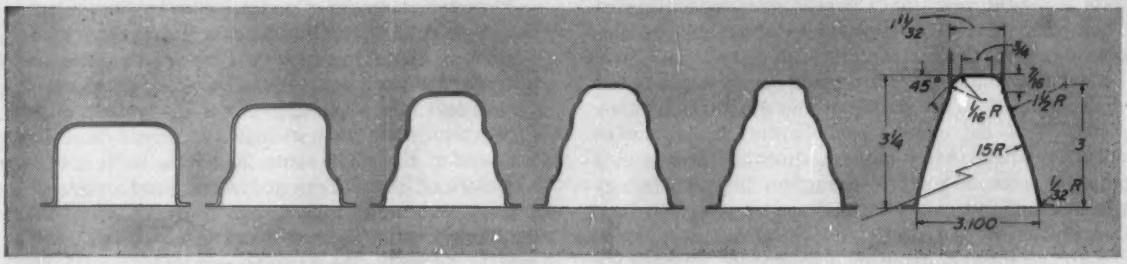


FIG. 11 . . . A steep angle of the tapered shell increases the number of operations required. Heights of the various steps can be approximated by the designer

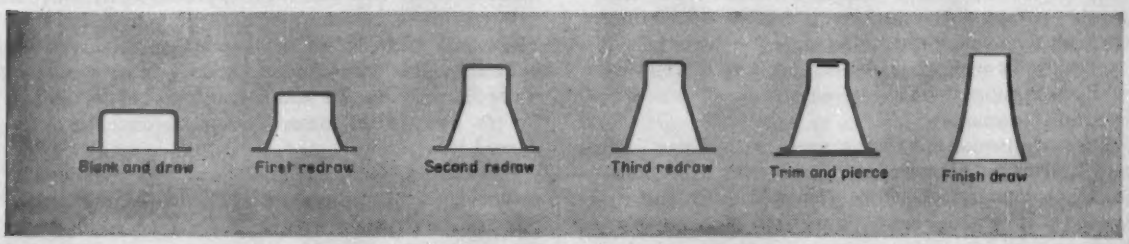


FIG. 12 . . . An alternate method of making a deep tapered shell involves redrawing a plain shell with a series of dies, each of which forms a small portion of the taper

COMPLETED PISTON after machining. Piston surfaces are not used as-extruded, but are given same finishing operations as cast piston

ETCHED SECTION of piston as extruded shows grain flow obtained with process. At right of this section is heavy wall for piston-pin boss

Tapco hot-extrudes aluminum pistons

Extruded aluminum pistons developed by Thompson Products Co., Cleveland, are now receiving cooperative field tests in the engines of a major auto builder. Tests will shortly begin by another builder of cars and by two truck and tractor manufacturers.

Hot-extruded from an aluminum casting alloy, the pistons are reported to be 50% stronger and 30% lighter than conventional cast pistons. Commercial production of the pistons will await results of exhaustive road tests, but production rate is estimated at better than 300 pistons per hour from one press with a single operator. Current gravity casting at Thompson in steel dies produces about 100 pistons per hour from three machines with one operator.

Cast aluminum slugs are cut from continuous bar stock, roughly to the diameter and dimensions of the piston. This cut can be made either by a saw or abrasive wheel. After cutting, slugs are heated in a rotary-hearth or electric-induction furnace. Induction heating is preferable because of the even heat distribution in the slug.

Extrusion takes place in a hydraulic, crank-type press. A press of this type, combining the operating features of hydraulic and mechanical operation, would presumably give a pressure distribution through the cycle more appropriate for the extrusion operation, as well as providing positive die closure, while retaining the slower metal flow obtained by hydraulic pressure.

Dies are preheated in the press with a gas torch and lubricated between each pass with a graphite-grease compound. Flash is removed from the extruded piston with conventional trim dies. Parts are heat-treated in a gas or electric circulating-air furnace to bring out the desired physical properties.

Finish machining, which follows, requires the same number of operations as with a cast piston, but does require less time. The extruded piston has positive location of machining points and is more precisely sized than cast pistons which are more subject to mold wear and to human error in insulation spraying.

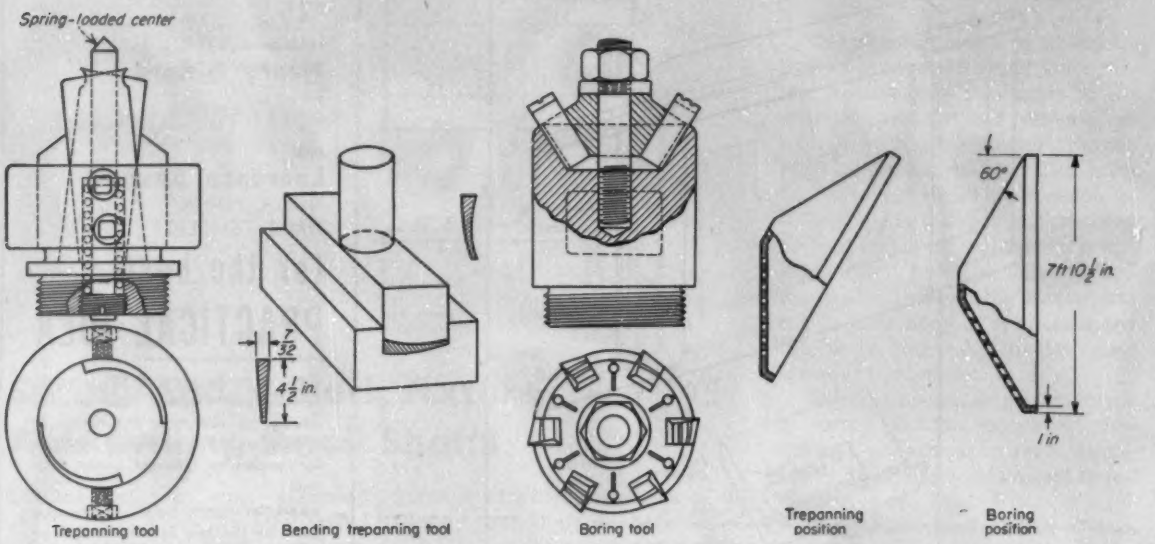
Major reason for developing the process, according to R. T. Lewis, light metals division manager at Thompson, was to meet the need for stronger pistons for higher compression ratios.

Previous attempts at piston extrusion have generally been cold. Metal Flow Corp. in Los Angeles has been cold-extruding pistons (part of the process is patented) on what amounts to a custom basis for racing cars and other specialized equipment. A firm in Germany has been extruding pistons on a low-production basis for some 30 years. Both methods had serious drawbacks for mass production.

Cast-aluminum ingots, for example, cost about 21c per lb, while extruded bar stock costs 35 to 38c per lb. To make the process competitive with casting, Thompson engineers sought a method of extruding from cast alloy. They have been able to get continuous cast bars of cast alloy that can then be cut into slugs. Effect on the metal of the extrusion operation plus the subsequent heat-treat gives required properties. To take advantage of Metal Flow Corp's early filing date, Thompson recently purchased this patent.

Laboratory tests at Thompson have shown no fatiguing at 40 million test cycles with a simulated engine compression ratio of 13.8 to 1. A similar piston made by conventional casting process showed fatiguing at 10 million cycles.

Practical Ideas . . .



Special Cutting Heads Finish 1066 Holes

In four conical boiler ends we had to make 1066 tube-holes of a diameter of 4 in., in workpieces that were 7 ft, 10½ in. OD, 1 in. thick. To make money on the job, the boring tools had to be cheap, and quickly and easily adjusted for wear or breakage.

Because of the conical shape of the workpieces, we did the job in two steps—trepanning and finish-boring. A head provided with two cutting tools was used for trepanning. The cutting tools were HSS, taper-section 1½ x 7/32 in., as used in England. They were heated and bent, in a press, so the tools had an effective cutting OD of 3¼ in. A ring with four screws kept the tools in position, and the tools could be moved outward, to allow for wear.

The center of the trepanning head had a strongly spring-loaded center-point, which was used when moving from one hole to the next. As the cutting tools advanced, the center-point was forced back, until, when the piece broke free, the strong spring on the point pushed the piece out of the way, preventing jamming in the tools.

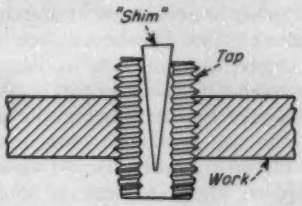
A head with six tools of ⅝-in. square HSS was used to finish-bore the work. The tools were placed in an inclined position, so, when worn, they could be moved outward.

The disks cut out in the trepanning weighed more than 2200 lb, and, being of good material, were used when making flanges.

The two positions — trepanning and boring—are shown above. Trepanning was done at 90° to the surface of the boiler ends, while boring was done parallel to the axis of the boiler. When trepanning, the length of cut was slightly longer than the thickness of the work. When boring, it was about 4 in. *Carl Jensen, Copenhagen, Denmark.*

Steel Rollers Aid Bandsaw Work

When handling heavy work (which has a flat-bottom surface) on the bandsaw, such as sawing holes in a dieset, place several steel balls under the work, to make it easier to move. To keep the balls handy, fix a box on the bandsaw, to hold the balls when not being used. *George R Cook, Independence, Mo*



Copper "Shim" Opens Tapped Holes

If a tapped hole is too tight, and the screw thread diameter is as small as it can be made, there is a simple way to slightly enlarge the tapped hole. Just put a piece of copper or brass sheet or rod in one of the flutes of the tap and pass it through the tapped hole. A little practice will establish the amount of "shimming" needed to enlarge a hole a given amount. *Federico Strasser, Santiago, Chile*

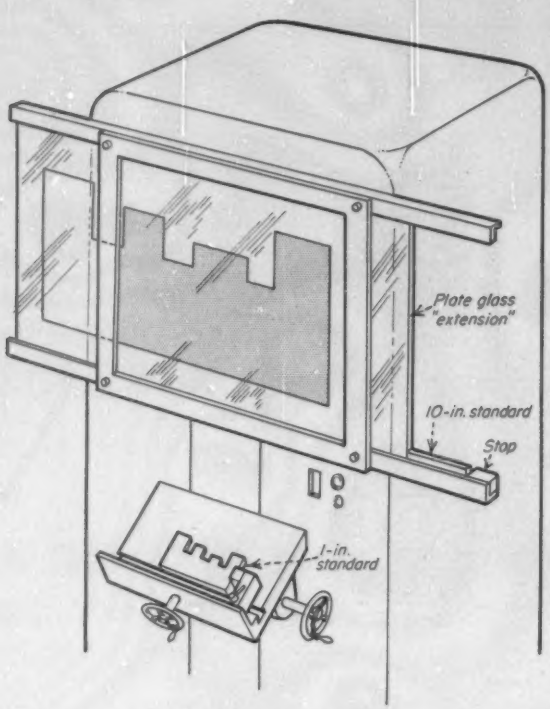
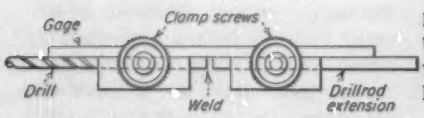


Plate-Glass Extension Adds Capacity To Comparator

Many times we have work too large for our optical comparator. The screen will take a layout of 18 in., with a 10-to-1 lens, so the largest workpiece we can show at one time is about 1¾ in. (The workpiece can be larger, but only 1¾ in. can be projected onto the screen at once.)

To give us more range, we put together an extension glass made out of two straight bars and a piece of plate glass, making a screen that can slide back and forth in front of the regular screen. With this sliding plate, we can use a layout of 30 in. or longer, depending on the size of the plate glass. The lens is adjusted to allow for the distance between the sliding screen and the regular screen.

Stops can be set and, when the workpiece is moved 1 in. on the table, with a 10-to-1 lens, the sliding screen is moved 10 in. in the same direction. With this method a projector has two or three times the capacity it originally had. *Ottavio Cerullo, East Boston, Mass*



Bandsaw Welder Butt-Welds Small Drill Extensions

Here is a handy way to butt-weld drill extensions:

Take the twist drill and the appropriate size of drill-rod and weld the ends together in the bandsaw welder, which almost any shop will have.

The gages on the welder and the welding-pressure selector keep the two ends together, in line and concentric.

We weld drills from 0.025 in. to 0.187 in. diameter with this handy method. *Joseph Mate, Chicago, Ill*

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PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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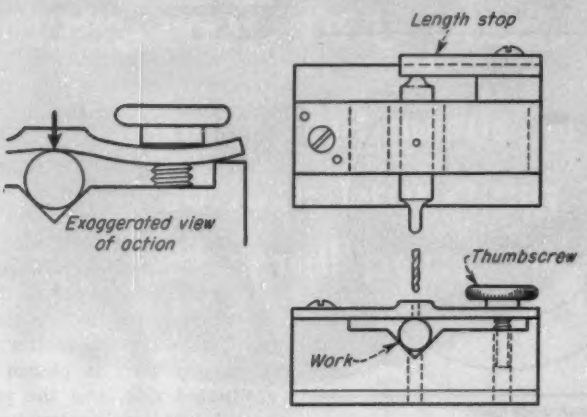


Spring-And-V-Block Fixture Aids Drilling Small Shafts

Drilling holes in small-diameter shafts, like those in instrument work, is often a difficult operation. Any play in the jig will displace the center of the cross-hole to a relatively large extent, so the part must be held firmly by the jig, regardless of small variations of diameter from shaft to shaft.

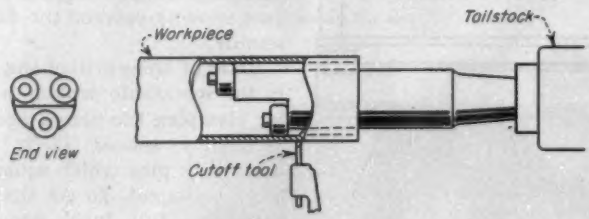
A jig, with no moving parts, which we have found very good for such work, consists of a V-block covered by a spring. The spring can be tightened by a thumbscrew. In the spring is a hole drilled to serve as a drill guide. If necessary, a bushing can be placed in this hole.

This design proved to be excellent in production work, for drilling crossholes in thousands of instrument shafts and pinions, in which the shaft diameters ranged from 0.080 to 0.200 in., with drilled holes from 0.024 to 0.056 in.

The hole in the spring is centered by trial and error, and, when properly located, holes for locating pins are drilled through the spring into the V-block body. Pins are inserted into these holes, and the fastening screw is tightened.

The small angular displacement in spring position caused by production variations in shaft diameter did not affect the correct functioning of the jig.

An important advantage of this device is its small weight, especially when drilling holes less than 0.049 in. Cover springs are changed when drill sizes are changed. *M Barash, Haifa, Israel*

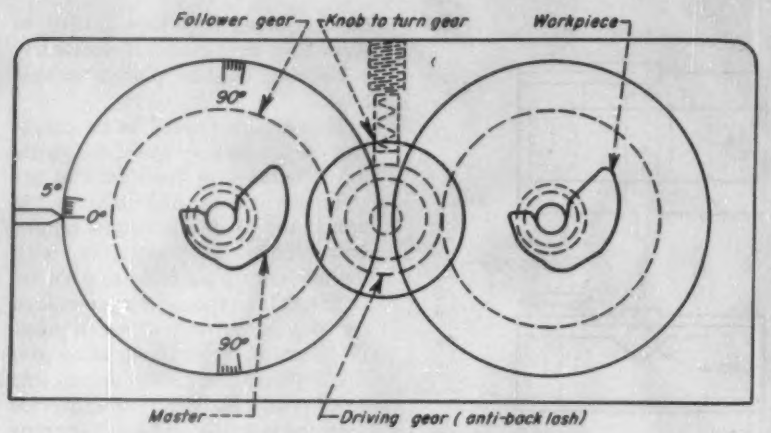


Simple Tailstock Attachment Aids Aluminum Tube Cutoff

We recently had a job which required cutting off aluminum tubing. The tubing was too large to fit inside the spindle of our lathe, and bandsawing left the ends not square enough for the next operation. We made a tailstock attachment for the lathe, and the problem was solved. The attachment consists of a heavy bar turned to fit the taper of the tailstock. The other end of the bar was cut with a step, and three shielded ball bearings were mounted on the stepped end. The bearings were equally spaced from the center of the bar, with a sliding fit on the tubing. The bearing offset allows the tubing to be slipped on easily, in spite of the burr from the cutoff tool.

To use the device, a length of tubing is gripped in the chuck, with a plug inside the end of the tubing to prevent the chuck from collapsing the work. Then the tailstock support bar is mounted in the tube, the bearings resting beyond the point that the tubing will be cut off. After cutoff, the work drops onto the bar. If the piece is long, it is removed and the cycle is repeated When narrow pieces are being cut, several can be done before any are taken off the bar. In any case, the axial distance between the bearing on the end and the other two bearings should be greater than the width of the piece being cut off.

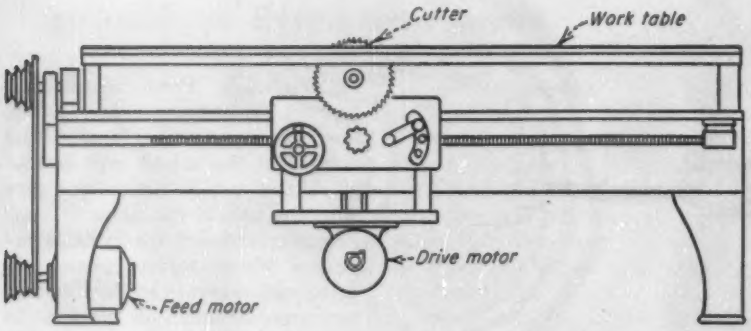
Before this device was made, we had tried a steadyrest, but it took too much time for readjustment, and left marks on the work. The follower rest wouldn't work either, because there was no support on the front of the tubing, and the work would bounce forward when the cut was completed. The method shown here avoided these troubles and did a good job in a very short time. *H Koslow, Bronx, NY*



"Dividing-Head" Device Checks Complex Electronic Parts

Shown above is an inspection tool we had to make to inspect and reproduce rotor curves and similar forms, for the electronics industry. In the development of these curves, electric calibration is the critical standard, and, when we are given a sample plate or templet from the lab, dimensions are often lost in the "cut-and-try" method to produce calibration specifications. Then it becomes necessary to duplicate or reproduce the sample to close tolerances.

Now that plate curves are more critical than ever, it is necessary to use such a device as the one shown, to make parts that will do more difficult work. This condition led to the double-faced "dividing head" checking tool shown. With this tool, when the master templet or sample part is placed on the graduated side, and the produced part is set up identically on the other plate, the production part becames easy to check with a height gage and indicator, and figures are found which will be helpful in future manufacture. The method can also be used for inspection and reproduction of small cams and other such shapes. *Walter Yeager, Sr, Maple Shade, N J*



Improvised "Slotting Machine" Speeds Work On Plates

To speed up cutting of brass and aluminum plates, we picked up a very old lathe and built the sawing machine shown above. We removed the head- and tailstock from the lathe, and mounted a home-made worktable over the lathe bed. The compound rest and cross-slide were removed from the carriage, and a set of ball-bearing pillow blocks were mounted on the carriage, to take the shaft and saw. Extensions were added to the back and front of the carriage, to permit a plate to be mounted below the bed, on which we put a 1½ hp motor with dual V-belt drive to turn the cutter. Shims under the motor adjust belt tension.

The feed-drive motor was mounted under the end of the lathe, with 4-step pulleys and V-belts to drive the feedscrew. This gave us four feeds; to get other feeds, the change gears are switched. A guard (not shown) covered the drive assembly.

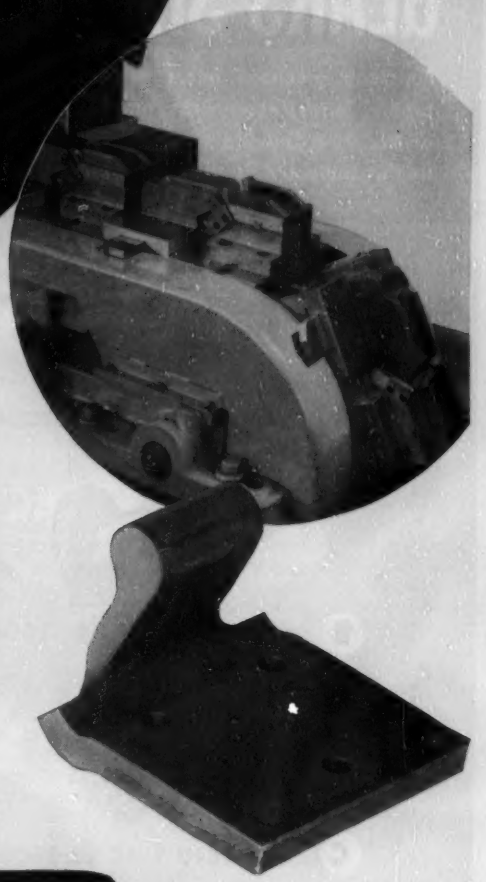
Rows of holes drilled and tapped in the worktable provide a means for clamping the plates, and other accurately spaced (1-in. apart) holes took pins which squared the piece being cut. To get sizes other than one full inch, equal-sized spacers were put between pins and work.

The feed motor is reversible, and the carriage is fed back to starting position while the operator unclamps the stock. Because feed is automatic, we plan to put precision limit switches on the bed, to stop the drive motor and reverse the feed motor at the end of the cut. This will permit the operator to deburr one plate while making the next cut. With this arrangement we can save quite a bit of time, compared to former methods of cutting, and we get much straighter cuts, resulting in saving of time, money, and material. *Clifford Molloy, Bronx, NY*

lower cost per piece . . .

with continuous surface broaching of small parts

• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.



• In many plants where large quantities of duplicate metal parts are being machined substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching in many fields.

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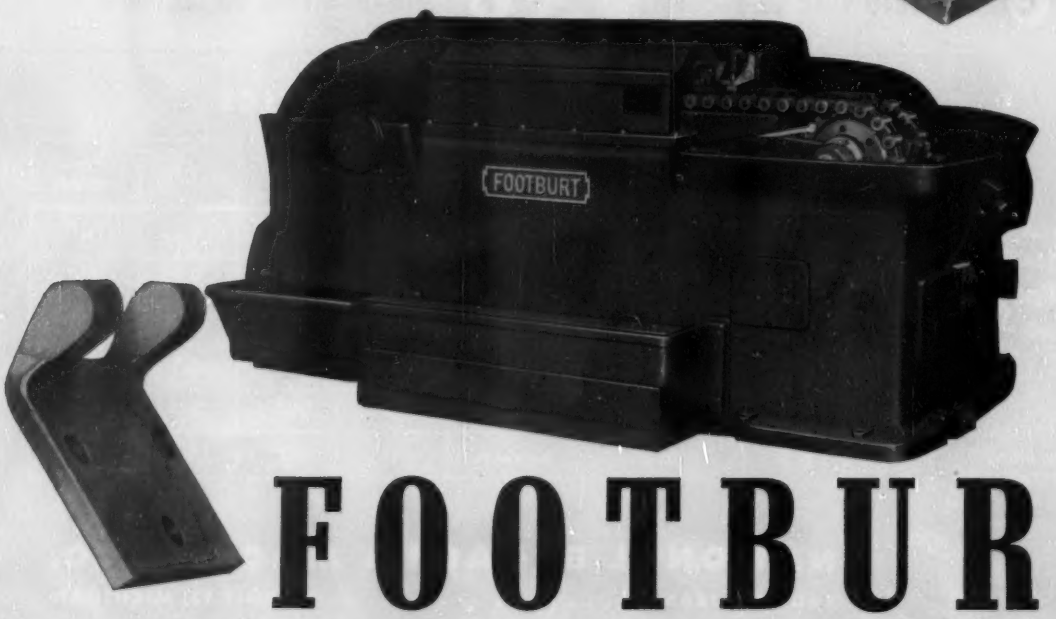
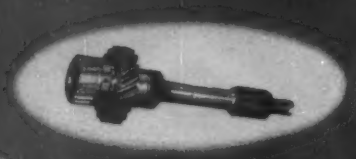


FOOTBURT

PRODUCTION MACHINE TOOLS

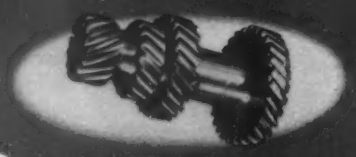
GEARS SHAVED in 12 to 20 SECONDS

Finishing precision gears to close tolerances on tooth profile, index, eccentricity and tooth surface smoothness on Red Ring Shaving Machines is a high production operation as indicated by these random examples.

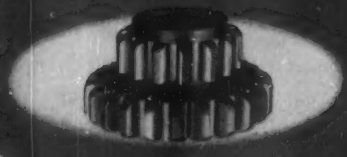


A SHAVING TIME 16 SECONDS

D SHAVING TIME 12 SECONDS



B SHAVING TIME 16 SECONDS



E SHAVING TIME 15 SECONDS

C SHAVING TIME 20 SECONDS

F SHAVING TIME 20 SECONDS

GEAR CHARACTERISTICS

Gear	Stock Removed Over Pins	Material	No. of Teeth	PD	DP	Face Width
A	.010"	Steel	19	2.4"	9.25	5/8"
B	.010"	Steel	29	4.00	9.25	11/16"
C	.010"	Cast Iron	28	2 5/16"	10	1 1/16"
D	.005"	Steel	12	1 1/8"	13.5	1"
E	.006"	Steel	14	2 1/16"	6/8	11/16"
F	.012"	Aluminum	54	5 7/16"	10	7/8"

WRITE FOR DESCRIPTIVE LITERATURE ON *Red Ring Gear Shaving*

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American Machinist REFERENCE BOOK SHEET

How to Select Chip Breakers . . . I

ERIK K HENRISKEN, professor of mechanical engineering,
UNIVERSITY OF MISSOURI, COLUMBIA, MO

Any style of chip breaker should be based on the principle of the chip-flow circle (*AM*—April 26, 1954, p117). This is the characteristic relationship between width w and height h of the chip breaker. Consequently, with suitable modifications, all styles of chip breakers can be designed and dimensioned on the basis of the data given previously.

STYLES OF CHIP BREAKERS

A chip breaker can be either of the *ground type* (Figs. 1, 3, and 4) or of the *clamped type* (Fig. 2). A ground chip breaker is ground down into the carbide blank; a clamped chip breaker consists entirely of a block of a hard material, with a beveled edge, and clamped upon the face of the cutting tool.

A ground chip breaker is either of the *step type* (Figs. 1 and 4) or of the *groove type* (Fig. 3). The step-type chip breaker has a step or shelf with a *floor* and a *slope* (*AM*—Apr 26 '54, p122, Fig. 13). The cutting edge and the floor are located below the original cutting face. The floor represents a new cutting face and should be ground with the required rake angle. The slope should be designed for easy chip flow.

The groove-type chip breaker has simply a shallow groove ground into the cutting face, at some distance from the cutting edge. The height of the cutting edge is not affected by the chip breaker, and the rake angle is primarily determined by the original cutting face of the tool.

Any chip breaker can be either of the *parallel type* (Figs. 1, 2, and 3) or of the *angular type* (Fig. 4). With the parallel type the heel is parallel to the cutting edge. Consequently, the profile of the chip breaker and also width w, are constant throughout the length. With the angular chip breaker there is an *opening angle*, between the heel of the chip breaker and the edge of the cutting tool. The opening angle is *positive* when the chip breaker is wider at the back of the carbide blank, and it is *negative* when the chip breaker is wider at the tool point.

The angular chip breakers illustrated are of the ground step type. Clamped chip breakers are frequently made slightly angular. Groove-type chip breakers can be made angular if desired. This practice does not seem to be common in the United States.

CHIP-BREAKER LIMITATIONS

When properly dimensioned, the ground, parallel, step-type chip breaker can be made to work successfully in any combination of cutting conditions. But this type is not a *universal* chip breaker, and it has other limitations. The chief disad-

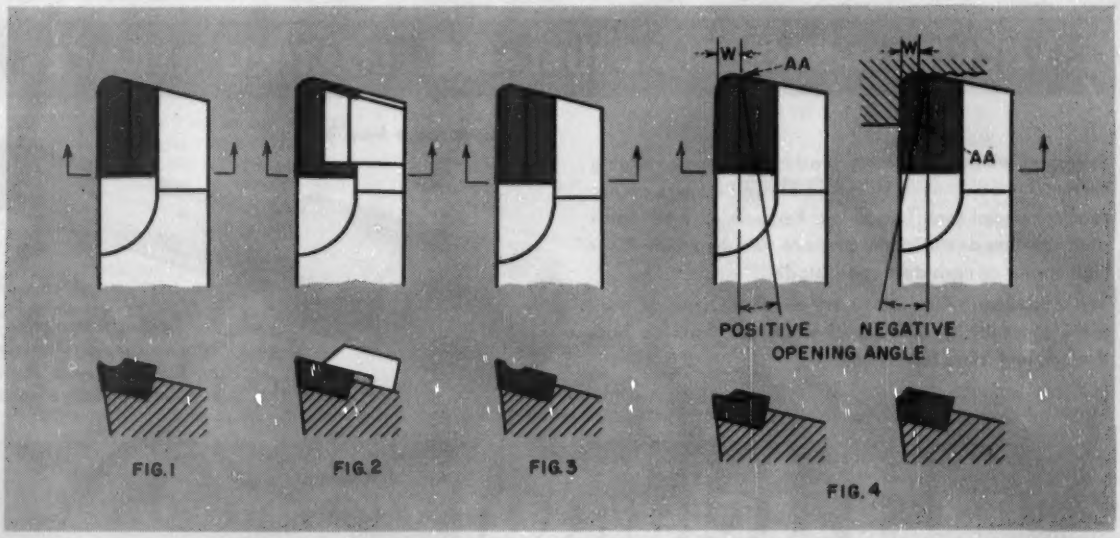


FIG. 1 . . . A ground chip breaker of the parallel, step type. **FIG. 2 . . .** A clamped chip breaker of the parallel type. **FIG. 3 . . .** A groove-type chip breaker of the ground, parallel type. **FIG. 4 . . .** Angular chip breakers with positive and negative opening angle; ground step type

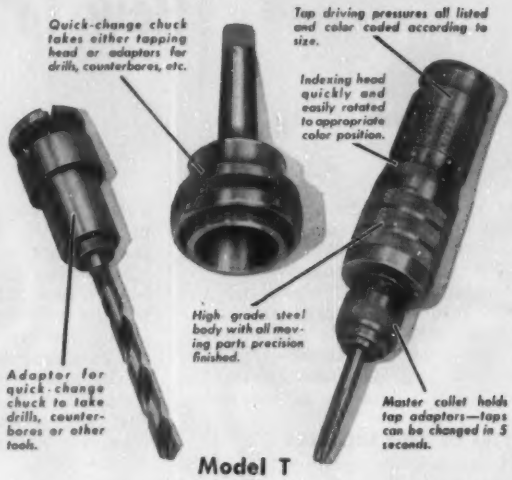
WICKMAN TAPPING ATTACHMENTS
Instant Pre-Selection of Tapping Torques

Pre-selected tapping torques are instantly obtained by presetting the pressure on a two tooth clutch to the required tap size. This is done by means of a highly resilient pressure unit which allows the clutch to slip when tap is overloaded.

WICKMAN HIGH SPEED TAPPING ATTACHMENTS (Model K) are furnished with Morse Taper Shank attached as an integral unit. Special shanks are furnished on request.

WICKMAN COMBINATION TAPPING ATTACHMENTS (Model T) are designed to fit readily into or be removed from their quick-change chuck even while machine spindle is running. Wickman adaptors for holding drills, counterbores or any other tooling required for your operation can be inserted in the same chuck.

Models K & T sizes and range: from 3/16" to 1¾".


Quick-change chuck takes either tapping head or adaptors for drills, counterbores, etc.
Tap driving pressures all listed and color coded according to size.
Indexing head quickly and easily rotated to appropriate color position.
High grade steel body with all moving parts precision finished.
Adaptor for quick-change chuck to take drills, counterbores or other tools.
Master collet holds tap adaptors—taps can be changed in 5 seconds.

Model T

Model TS

WICKMAN TAPPING ATTACHMENTS FOR TURRET LATHES (Model TS) are considerably shorter than Models K & T. They also permit presetting of tapping torque required for any tap size or material, thus preventing tap breakage in blind hole tapping or materials difficult to tap.

Model TS sizes and range: from 3/16" to 1".

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Equipped with fully floating blades and direct reading micrometer adjustment, Wickman-Brown Reamers do not require special tools for setting. Reamers may be operated rotating or stationary and are furnished with either high speed or carbide tipped blades.

Wickman-Brown Reamers assure absolute accuracy, complete concentricity and superfine surface finish on both through and blind hole reaming.

Sizes range from ¾" to 4"

Model SL

For further information concerning Tapping Attachments or Reamers send for your copy of descriptive literature.

THE Wickman MANUFACTURING CO.

10325 CAPITAL AVENUE
OAK PARK (Detroit 37), MICH.

How to Select Chip Breakers... II

vantage is the relatively high grinding cost, in terms of carbide and diamond-wheel material. In the initial grinding, a strip of carbide from 0.015 to 0.030 in. thick is sacrificed. Sharpening on the cutting edge decreases the width of the chip breaker. After a few sharpenings, the chip breaker must be reground to its original dimensions.

Unless the carbide blank is raised above the tool shank, or a relief groove is provided behind the blank, the grinding wheel will cut into the shank material (Fig. 5), and load and glaze.

Another disadvantage of this chip breaker is lack of flexibility. Each chip breaker has a fairly limited field of application. If used otherwise, the dimensions must be changed by grinding.

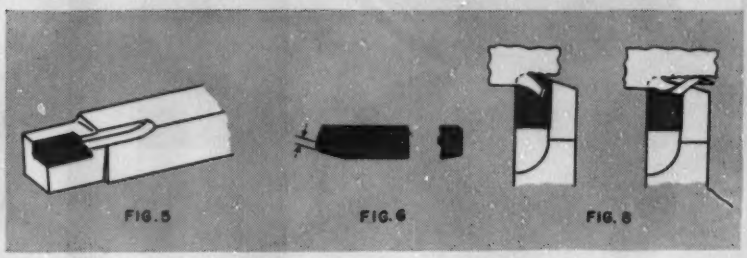


FIG. 5 . . . Undesirable design of a carbide tool. Chip-breaker grinding wheel cuts into shank material. FIG. 6 . . . Carbide insert, with factory-ground chip breaker of the positive angular type. Effective width w is measured at the tool point. FIG. 8 . . . Two angular chip breakers with different negative opening angles. When the opening angle is too large, the chip may hit the finished surface and cause damage

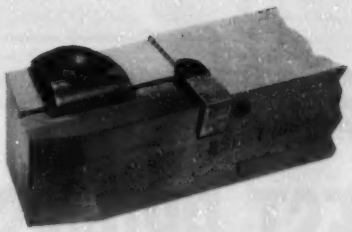


FIG 7 . . . Toolholder (Kennametal BRH-16) with insert (style HS) with factory-ground chip breaker of the angular type. *(Courtesy, Kennametal, Inc, Latrobe, Pa)*

ANGULAR-TYPE CHIP BREAKERS

Because any angular chip breaker has a varying width, it is necessary to define its *"effective width."*

The effective width is "the width that curls the chip," and that, again, is the *minimum width in contact with the chip.* For the positive angular chip breaker the minimum width is obviously the width at the tool point (Fig. 4, left), indicated by arrow *AA*. For the negative angular chip breaker the effective width is the width at the surface of the workpiece (Fig. 4, right), arrow *AA*. The effective width should be used in all computations based upon the charts and tables in the previous article.

The effective width for the positive angular chip breaker is constant, and is determined by the way the tool is ground. This chip breaker can therefore be used with the same degree of chip-breaking performance for varying depth of cut, within the same limits as the parallel type. On the other hand, the effective width of the negative angular chip breaker depends upon the depth of cut. This type of chip breaker should, therefore, be used for long runs on constant depth of cut; the chip breaker being specifically designed not only for the feed, but also for the depth of cut in the particular cutting operation.

Factory-ground chip breakers with a positive opening angle are available in the form of carbide inserts for clamping into a toolholder (Figs. 6 and 7). The effective width is easily adjusted by grinding off either the side-cutting-edge or the end-cutting-edge. This type of tool is well suited to roughing cuts, particularly, but not necessarily, on uneven surfaces, such as forgings. Incidentally, the factory-ground chip breaker has the further advantage that it eliminates the need for the chip-breaker-grinding operation.

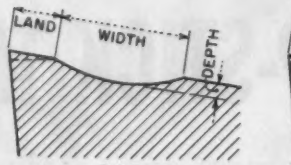


FIG. 9

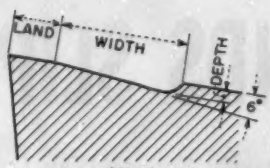


FIG. 10

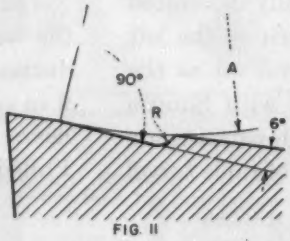
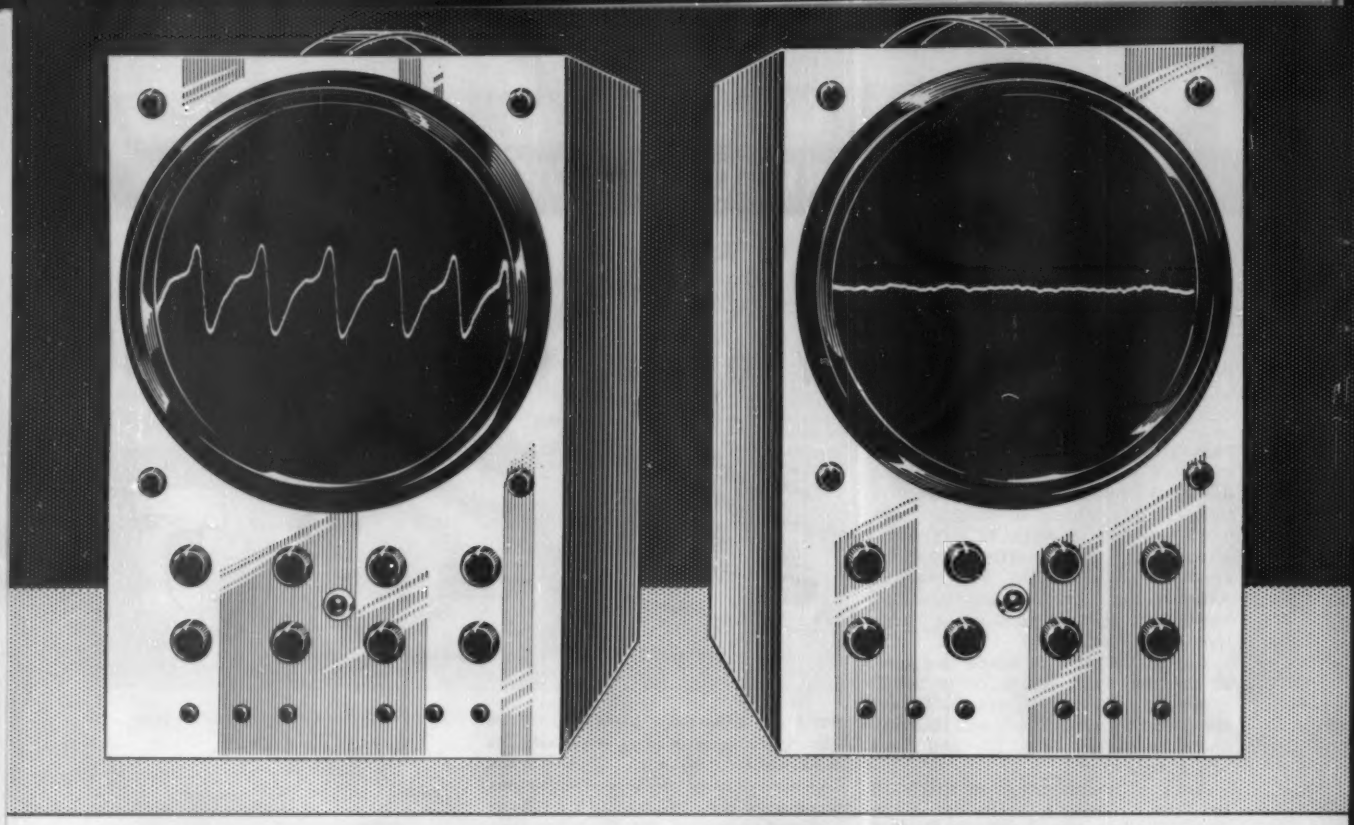


FIG. 11

FIG. 9 . . . Elements of a groove-type chip breaker with round groove. FIG. 10 . . . Elements of a groove- type chip breaker with tilted V-groove. FIG. 11 . . . Geometry of a groove-type chip breaker

The negative-angular chip breaker is useful on fine cuts that are difficult in chip breaking, because the device has a strong tendency to direct the flowing chip back against the unmachined surface of the workpiece. This action assists in breaking the chip. Good results are usually obtained with opening angles from –8° to –15° and up to –25°. An angle as high as –45° is not recommended,



WHEN A STRAIGHT MINERAL OIL was used to lubricate the ways, an 0.0008″ jump at frequency of 2.74 cycles per second was noted.

WHEN SUNOCO WAY LUBRICANT was used on the ways, the jump was too small to measure, proof that this medium stops slip-stick motion.

TEST PROVES SUNOCO WAY LUBRICANT ENDS SLIP-STICK TABLE MOTION

How effectively Sunoco Way Lubricant stops slip-stick table motion is graphically illustrated by these oscillograms. The pattern on the left was made with a straight mineral oil as the lubricant; the other was made with Sunoco Way Lubricant on the ways. Both patterns are magnifications of changes in rate of table travel and were obtained under identical conditions.

You can stop slip-stick table motion, protect the ways, get better surface finishes, cut production losses with Sunoco Way Lubricant. Try it in your shop. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-5.

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How to Select Chip Breakers ... III

because this may swing the chip over against the finished surface (Fig. 8). One advantage of the negative opening angle is that it provides a runout path for the grinding wheel.

GROOVE-TYPE CHIP BREAKERS

Essentially there are two types of grooves, the round groove and the tilted V-groove (Figs. 9 and 10). The round groove is cut by a narrow wheel, usually not more than 1/16 in. wide; the width of the groove can be regulated by swinging the plane of the wheel from 5° to 15° out of the direction of table travel. The tilted V-groove is cut by an ordinary chip-breaker wheel, with the tool tilted an additional angle; the usual recommendation is 6°. The rake angle on the chip-breaker floor is thereby increased by the same amount.

Various recommendations for dimensions of groove-type chip breakers can be consolidated as follows:

Land—0.015 to 0.030 in. or 1 to 1½ times the feed

Width—1/16 to 3/32 in. or 2 to 4 times the feed

Depth—0.005 to 0.010 in.

Sometimes a 2° to 5° negative rake is recommended on the land, to strengthen the cutting edge, which is somewhat weakened by the unavoidable undercut of the groove.

To design the groove-type chip breaker on the basis of the chip-flow circle, use this procedure:

Draw the profile of the cutting edge and the planned chip breaker in large scale (Fig. 11). Construct the inscribed circle in the groove. If the radius in this circle is found to be A, then the chip-flow circle radius B can be taken approximately as

$$B = 1.75\ A$$

The charts and data from the previous article can be applied with this radius.

Choose the fillet radius R (in the case of the tilted V-groove) in accordance with the rules given previously, in order to facilitate a smooth chip flow.

The undercutting effect of the groove tends to weaken the cutting edge. This chip-breaker type therefore works best at medium feeds. Within its range, its action is less drastic than the step type, so that it tends to produce helical chips rather than broken chips.

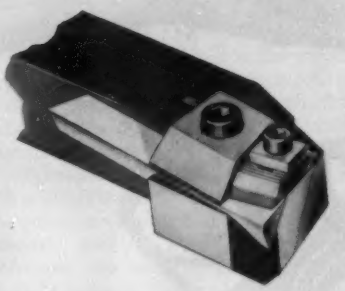


FIG. 12 . . . Toolholder with triangular toolbit and adjustable clamped chip breaker. *(Courtesy Everede Tool Co, Chicago 39)*

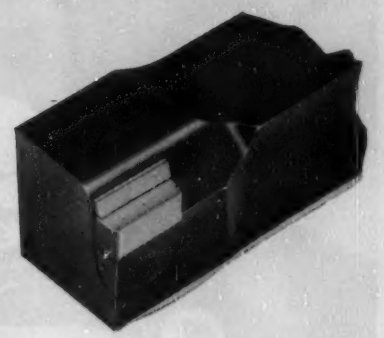


FIG. 13 . . . Holder for straight turning tool ("S-70-RKVB") with adjustable clamped chip breaker. *(Courtesy The Viking Tool Co, Shelton, Conn)*

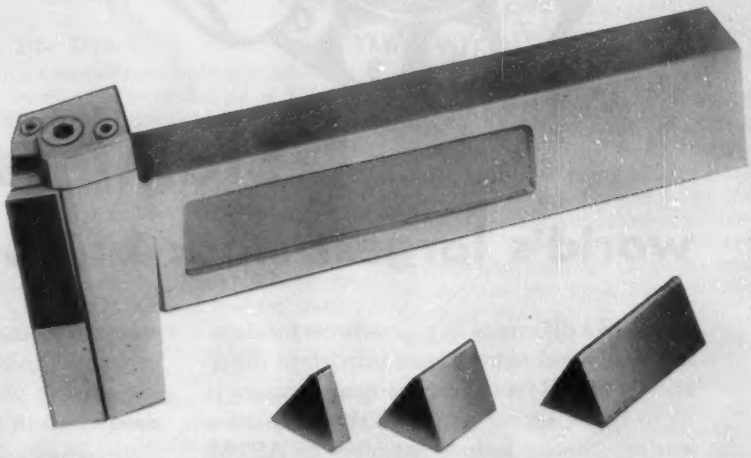


FIG. 14 . . . Toolholder for indexing insert (V-R vertical) with permanently clamped chip breaker, and three insert lengths. *(Courtesy The Vascoloy-Ramet Corp, Waukegan, Ill)*

The principal advantage claimed for the groove-type breaker is low grinding cost, because the depth is only 0.005 to 0.010 in. It is practical to use a small (3-in. dia.) metal-bonded wheel, operating with fast traverse and a small feed (0.0003 in.) for each pass.

CLAMPED CHIP BREAKERS

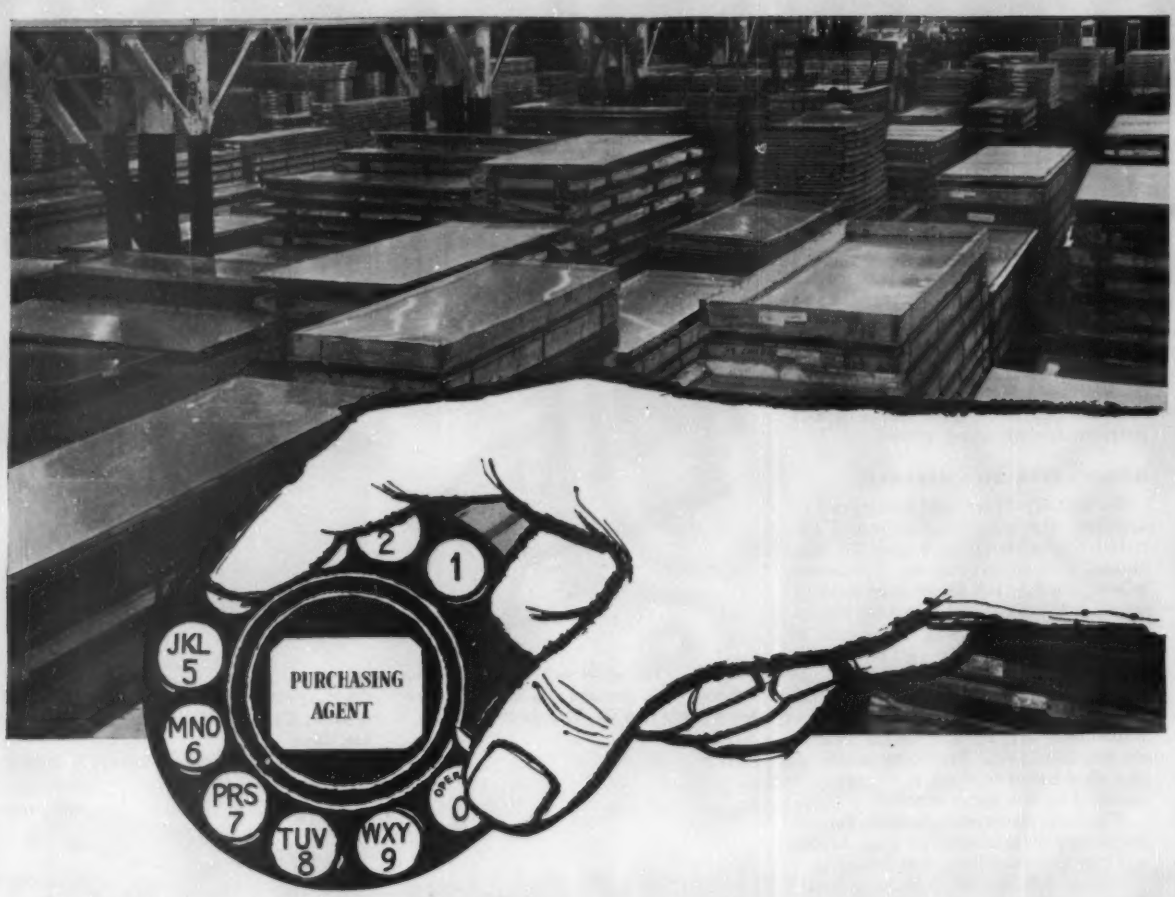
A clamped chip breaker must possess these characteristics:

(a) Rigid clamping, so that it is not moved out of position by chip pressure.

(b) Tight fit against the face of the cutting tool, so there is no opening to catch the chip.

(c) Adjustable to varying widths, if desired.

Several models of clamped chip breakers are available on the American market today. Some of these have the advantage of being adjustable. They represent the closest approximation, as of today, to the ideal universal chip breaker, because the effective dimensions can be set to desired cutting conditions. Others sacrifice adjustability, but attain a higher degree of safety and avoidance of improper use.



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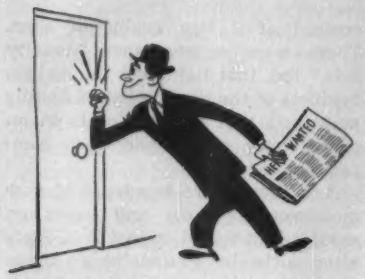
Talking Shop . . .



Slow-Down Hiring

"When the door opens, the bull runs in." Thus a prominent personnel director summarizes his attitude toward conventional methods of interviewing job applicants. Fast disappearing are the days of hiring a man because of his appearance, his membership in clubs or societies, his college degree. Experience has taught this philosophy: It is better to have an initial heavy turnover in job applicants, rather than later on in employees. Today's coming trend is toward scientific selection of executive, sales, and supervisory applicants.

Selecting the right man for the right job can only be done successfully when the interviewer is guided by results obtained from the applicant's aptitude test. These tests point out whether the applicant has what it takes to stand the "gaff" of the position, thereby determining whether his period of employment is likely to be short or long.

Jack Klein, of the Klein Institute for Aptitude Testing, cautions interviewers against hiring an applicant, if he falls into any one of the following knock-out categories:

1. Divorced or separated within the last two years, questionable risk if within three to five years
2. Too many changes of address within a 5-year period
3. Failed in own business
4. Owes too much money
5. Unexplained gaps in employment
6. Taking present position with lower salary than last position.

Electronic Filter

Hotpoint has just introduced a filter for air conditioners that at last uses electrostatic effects in plastics. It is two layers of fabric of coarsely woven polyethylene fibers. Friction of the air through the filter screens sets up an electrostatic charge that attracts and traps microscopic particles of dust, pollen, and animal life. Might be a principle applicable to Metalworking.

Portable X-ray

Argonne National Lab, Lemont, Ill, has developed a small, inexpensive, and portable X-ray unit. It has a tiny particle of thulium as the radioactive element, mounted in a source holder and shielded with a shutter mechanism operated by a standard photographic cable release. The unit weighs under 10 lb, but is comparable to a 100,000-volt X-ray machine and requires no power supply. The first model cost $40, plus irradiation charges, was based on British designs but is several hundred times more powerful because of better reactors and rare-earth separation equipment here. The thulium, an extremely rare material with little previous practical application, came from the AEC Lab at Iowa State College.

Site Errors

Six errors are common in selecting a plant site, according to A Kingsley Ferguson, vice-president of Walter Kidde Constructors, Inc. They are:

1. Lack of thorough investigation and consideration of factors involved. This is common where management knows "instinctively what's best for us"—and selects on a basis of past experience. Former production men pick for labor and material supply, former salesmen pick for nearness of market, etc. Several minor factors, added together, may mean more.

2. Personal likes and prejudices of key executives or owners. Whim, bias, or mis-information on the part of an executive frequently commits a good and impartial site survey to the waste basket because it "just doesn't look right."

3. Inertia to move from home ground. Personal considerations, such as home, club, recreational facilities, or friendships often influence executives not to consider a move that would save the company money.

4. Moving to areas already or about to be overindustrialized. Plant sites may be selected by word-of-mouth recommendation of another executive, or because of inducements such as tax exemptions and rent-free buildings. But continuing increases in companies in an area may overindustrialize it and nullify all gains.

5. Selection of an existing structure at an imagined bargain. If optimum location and design are compromised to grab a bargain, be sure of three things: that the structure won't require as much to rehabilitate as it would to build new, that materials-handling cost will be reasonable, and that location is right.

6. Choice of a community with low cultural and educational standards. Eventually, key administrative and technical personnel will leave if educational and cultural opportunities are not up to the old standard.

Auto Slanguage

The auto business spawns a number of words or slang expressions that sometimes creep into the general language, as for instance, the expressions used by typical used-car merchants. Production-line workers also have a jargon all their own. Ford Division of Ford Motor Co has compiled a few. Examples:

Sergeant's stripes: Chrome trim attached diagonally to the rear door or quarter panel.

Hockey sticks and bananas: Grille parts shaped like their nicknames.

Dagmar: The grille center section which protruded from the 1951 Ford.

Dog leg: Distinctive curve in the body at the bottom of the rear door.

Railroad tracks: The grooved chrome trim installed above the rear window of the Ford Victoria and Skyliner models.

Horsecollar: The U-shaped stamping which supports the radiator.

Spaghetti: A compound which is squirted along edges of fenders and other sheet metal parts before they are welded.

Stovepipe: The duct assembly which pipes fresh air into the heater.

Dum Dum: A sound-deadening compound.

Eyebrows: Front-window rain deflectors.

Tool Show Highlights

. . . they included newest developments in tooling and metalworking processing, exhibited by more than 500 leading manufacturers . . . plus five days of intensive technical sessions on every phase of tooling. Eleven *American Machinist* editors attended the Show and sessions. This is what they saw and heard

PHILADELPHIA — By week's end, the 1954 ASTE Industrial Exposition and Conferences had drawn the largest crowd in Tool Show history to Philadelphia's giant Convention Center. Thousands of tool engineers, manufacturing executives, and operating men thronged the exhibit halls to view the latest tools of their trade, displayed by more than 500 US and foreign manufacturers. Top-heavy attendance was recorded at technical sessions held throughout the week of April 26-30, and inspection tours of Philadelphia-area metalworking plants came in for their share of interest, too.

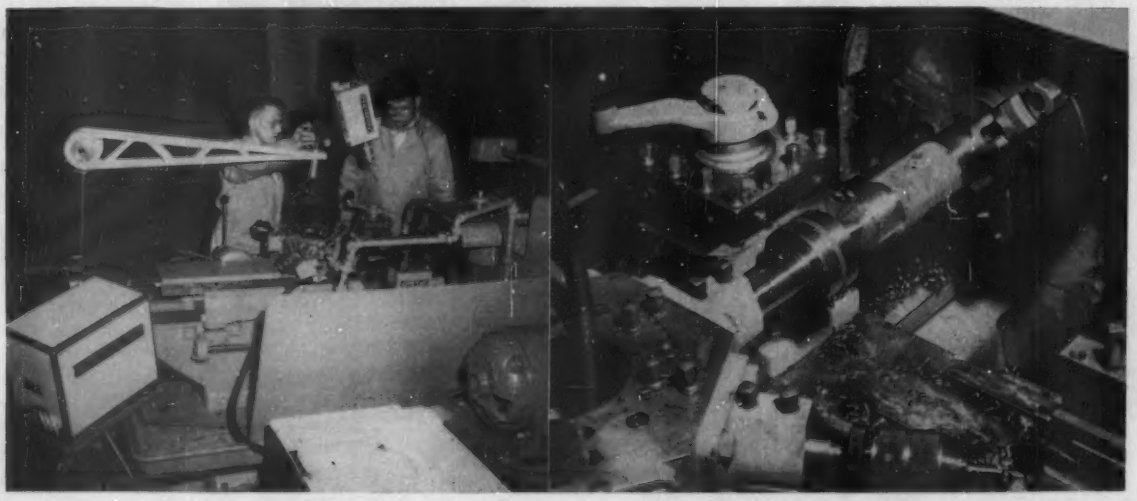
The Show

But in the midst of thousands of people and hundreds of machines—a little red hen stole the show. By pecking at a rubber ring at one exhibit, she released a bat that swung at a pitched ball on a miniature baseball field. If she connected squarely for a home run, the ball tripped a switch in the outfield, releasing a reward of a few grains of corn. There were a few other "novelty acts," too, that lightened the serious business of the show—that of finding new tools that will cut costs in an era of hard selling and keen competition.

And there were hundreds of new metalworking tools and gages on exhibit that would do just that. Aisle after aisle in Philadelphia's huge Convention Center was packed with the newest developments in metalworking tools and processes.

For instance, there was an exhibit of remote-control gaging, consisting of a potentiometer attached to a dial-indicator setup that permits instrument readings to be recorded on a chart, or to be shown on a meter at a quality control station or in the manager's office. Machine operator checks parts as usual, but using this setup, management can shut down a machine if production is moving out of the established tolerance range.

Another exhibit showed how in-



Color TV Cameras Watched . . . Turning . . . Convention Center Audience Watched

PHILADELPHIA — Running concurrently with the Tool Show on three alternate days (Monday, Wednesday, Friday) was ASTE's Carbide Seminar Program, held at and in conjunction with, the University of Pennsylvania. On the second day, closed-circuit color TV brought demonstrations to audiences in the auditorium of the Convention Center. Audiences at the Center and the University watched a Jones & Lamson turret lathe equipped with a Carboloy-350-tipped diehead run a ¾ x 10 thread 1¼-in. long at 1500 rpm in

spection can be automated: products are delivered by automation to machine's conveying system, then transported through two gaging stations, automatically sorted by acceptable size classifications, and rejected if need be—all at 1500-plus pieces per hour.

Then there was the contour projector screen that showed watch gears blown up to 30 times their size—opening up new fields for study of small mechanisms in operation, plus, of course, the usual measuring applications. Attachments for contour projectors now measure the distance between shoulders on a shaft, provide new facility in checking gear teeth.

A trend was noted toward development of special equipment that saves using a large press for second operations on shells. Formed work is further simplified by a trimming press using a shimmy die. Same principle is used for a tubing cutter that can be set to cut off either short rings or longer lengths of tubing.

Judging from the Show, air gaging is no longer confined to probes with fixed orifices. Now you can get adjustable snap gages operating on the air gaging principle, and plug gages with an extended range of adjustments. Gage designers are being encouraged to design equipment around standard units to save money.

Plated carbide is rapidly extending its applications — newest one is a backup plate for an abrasive belt grinder, to give far longer life. Carbide rings are being shrunk into feed rolls for spring winders—previously, carbide had normally only been inserted in draw dies (now up to 24 in. ID) and wire-drawing nibs.

A new geared-head precision lathe exhibited had a 13-in. swing, 60-change gearbox, with spindle mounted on tapered roller bearings, and cam-action tailstock.

A bench miller operated at 35,000 rpm under load. Head revolves through 360°, and armholding quill turns 60° in either direction, with ¼-hp output at quill. Table is 4 x 12 in.

Automatic drill unit shown has 3-in. stroke, is air-powered, with spindle speeds of 400-7240 rpm, and hydraulic feed control.

New spray cooling system mixes coolant and air at machine; improved coolant won't gum.

Two-jaw indexing chuck holds gate and globe valves to complete all finishing operations in one holding step. Jaws move in or out (2-in. travel), can be interchanged. Largest chuck available is 24 in., but 42-in. chuck has been designed. Chuck holds work so machined surfaces are within 0.001 in. square and parallel.

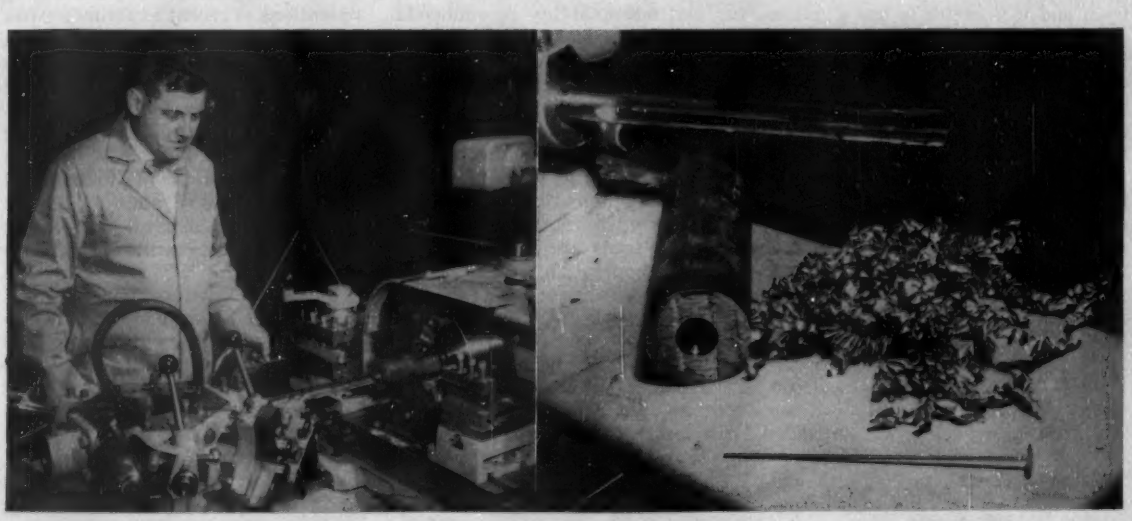
Expanding ball arbor chuck uses mass of free balls, over which split outer sleeve is pulled, expanding sleeve uniformly to grasp work. Repeats to within 0.0002 in.

Pinch-jaw for lathe chucks and other uses permits pinching-action jaws to move back and forth, so that work held at outer rim is not distorted.

Balancing machine automatically averages out-of-balance, comes to mean position in 7 sec, has rpm variable from 0 to 6000 continuously, and can be connected to drill that then automatically removes stock from right angular direction.

Foreign grinder works this way: form is dressed onto wheel by templet-tracer. Constant wheel sfpm is maintained, regardless of wheel diameter. Unit is said to grind to within 0.00005 in. OD, and can also be controlled by gage that stops infeed when correct size is reached.

Optical gaging system on jig borer



and Drilling . . . of 4140 Steel

This U of Penna Carbide Seminar on TV

48 sec. First 2½ in. dia 4140 steel, heat treated to Bhn 300-320 was turned down, with cut made dry to benefit TV picture clarity. Then two drilling operations were made on the same machine, one with a carbide-tipped (44A) twist drill, 1-in. in diameter, drilling at 1041 rpm and 0.015-ipr feed 6-in. deep; and the other with a target drill at 1041 rpm and 0.0012-ipr feed, drilling through an 8-in.-long billet in 5 min. Target drill was tipped with 883 Carboloy. Other demonstrations showed turning and milling with carbides.

needs no stop blocks for sizing to 0.0001 in. of true location. Open gate table for boring of large pieces.

Automatic turret lathe has five side and six end tool stations. Another turret lathe, drum type, has 16 tool stations, can chase six-lead thread. Preselected speeds.

Vertical turret lathe has pendulum control, with built-in dial indicators to check dimensions and tool locations during cutting.

Profile grinder works on rotating or stationary work, has 10 to 1 multiplication on templet; and pantographic displacement of follower over templet.

Milling Panel

Panel discussions by experts on a variety of metalworking practices drew heavy crowds on the technical side of the Tool Show.

Panel on improved milling practice covered machine design, tool problems, cutting fluids, milling specific materials, workholding and handling problems. Highlight points included:

What appears to be spindle flutter usually turns out to be poor slides, a loose table, or both.

Keyed cutters are obsolete. The key is the weakest link in a drive train and it is better to use a spline or polygonal spindle. Runout is frequently the result of poor spacers, which should be ground absolutely square. Bore recesses on face mills must always be checked for positive fit on the spindle nose.

Straddle milling, like key cutters, is practically obsolete. It is much more efficient to use a simple face-mill cutter on the spindle nose of a horizontal machine, even though you're doing only one side at a time.

Increasing the corner angle on a face mill from 30 to 75° will permit increase of feed up to five times.

SAE 1020 and 1030 at 1500-2000 sfpm and 0.025-0.040 in. chip load per tooth can be machined without difficulty and with good tool life.

Two panelists claim that, although they went to 12,000 and 15,000 sfpm with SAE 1020, neither could locate the "Valley of Death."

Recommended by a panelist: use carbide dry for roughing, then coolant for finishing and boring (continuous cut) of titanium.

Automatics Panel

Panel discussion on "The Why and How of Automatics" brought out these points:

Carbides will give good results on automatics if applied with discretion, i.e., each tool must be designed for a specific application and the right grade of carbide applied. Rigidity of toolholders, conditions of slides, etc, are important.

Speeds and feeds of cross-slide tools and end-working tools must be properly combined. When carbide form tool is used, make the tool so it will reduce product diameter as much as possible, then use a HSS parting tool. If the form tool has done its work properly, the cut-off tool will pick up the cut at the right speed and give long life.

Carbide chasers and thread-rolling tools have been used, but they need more developmental work, and a better carbide must be developed for rolls.

Carbide spade drills have been used on automatics to machine a 9/16-in. hole 4½ in. deep in steel, with only 0.005 in. runout and to a 15-20 micro-in. finish. Experiments on high-speed machining (600-1100 fpm) indicate better tool life and finish will result if chip breaker and nose radius are properly designed.

To get machinability data, screw machine users should (1) ask the vendor for steel analysis, heat number and machinability recommendation, or (2) send a sample to a commercial testing laboratory. Some plants centerless grind hot-rolled stock to remove surface imperfections.

If you have no planning department to decide speeds, feeds and tooling for automatics, ask the steel supplier.

Hopper feeds are actually in use on second-operation machines, but they are expensive and time is needed to work out bugs.

Technical Sessions

Here are random impressions gleaned by *American Machinist* editors during the five-day technical program of the 1954 Tool Show.

• **FORMING**—Walls less than 0.001-in. thick can be made for radio and TV tubes by forcing strands of metal through simple rollers mounted on a drill press: thickness reduction of 30 to 1 can be achieved in a single pass . . . Properly supported rubber clamps can transmit 30,000 psi pressures to plastically deform some steels, brass and other metals into shapes for such products as pressure cookers, electrical fixtures, radio and TV equipment . . . By fracturing round or square steel billets, tool life can be prolonged, waste is eliminated, and visual inspection for defects is helped materially . . . Cold steel can be squeezed into intricate shapes in a 3000-ton hydraulic press to produce clean basic designs for many products, with fewer operations and less expense than older methods, as for example, welding caps on tubes for hydraulic accumulators . . . Plastic tooling has been applied to mechanical presses, where high press speed apparently does not damage plastic dies. Even drophammer dies are now made, some with steel dies, some with both punch and die of ethyl cellulose. Auto bodies of plastic laminates are now made so surface does not craze. One material producer at the show estimated that cost curves for auto bodies, plastic laminates vs steel, now cross at about 15,000 units (over this, steel is less expensive, under it plastics are), or a unit cost of something over $400. If cost of plastic materials can be reduced, and labor costs, too, crossover might be extended as high as 50,000 or more.

• **MACHINING**—Mathematical analysis of orthogonal planing and boring operations in recent experiments has proved that such advance research will help production men overcome many cutting variables . . . The pantograph miller, a high-speed unit that uses a reduction ratio to trace a master pattern 10 times larger than the finished work, could in principle engrave the entire bible on a ½ x ⅜-in. piece of metal . . . Today's precision boring machines insure accuracy to within 0.0002 in., eliminate reliance on the human element, and use of costly jigs and holding devices . . . Tolerances as low as 0.00025 in. on flat stock can be held with coated abrasives on proper type of equipment . . . One machine removes 1 lb of steel per min with sandpaper . . . Hydraulically-powered machine, using an abrasive belt as the tool and progressive line-contact grinding as the method, is used to grind airfoil surfaces of jet-engine blades. Unit can be quickly changed from set-up for one blade contour to another . . . Re: cutting fluids — if sulfur is combined too strongly with oil molecules, it won't be released in sufficient quantity to prevent welding — and if combined too loosely, it will either corrode the tool or drop out of the oil while still in the drum

. . . Today's major problem in machining titanium is heat, which, because titanium is a poor heat conductor, focuses at the point of work, causing tool damage . . . CO_2 has been used successfully in broaching titanium, may solve the problem.

• **WORKHOLDING DEVICES**—Bottleneck at a precision parts manufacturing firm was broken when it was found that machining cost was prohibitive when tiny parts were clamped in a vise to allow a ½-in.-deep slot 0.09-in. wide to be cut. Solution: hold the part in place with a magnet . . . A common flashlight battery in a 4-in. dia magnet can lift 600 lb . . . A million holes an hour can be drilled in wall and ceiling tile using "gearless" drill heads that aren't limited by the number of spindles that can be used. And these multiple-spindle heads can be used in practically any metalworking operation that requires holes. Spindles can be placed closely in any pattern.

• **AUTOMATION**—Only completely automatic multi-purpose transfer machines can make 20-30 machining passes with a wide variety of tools at cycle rates from 60 to 125 operations per hr . . . Major units of V-8 auto engines are now all completely machined on transfer machines . . . Machines that design machines, that can do creative design thinking for themselves, may not be too far off in the future. But there'll still be a place for man in the setup — he'll have to feed and interpret information into the machine. What's more, the design machine may even feed the design into still another machine that can produce the required drawings, coded for automatic manufacturing.

• **ASSEMBLY**—Major part of human labor in plants is employed in applying fasteners. One way labor costs can be cut down is to check into new fasteners developments to see if there isn't a better and more economical means of fastening your equipment . . . Lowered prices of almost every hard goods product result from use of small rivets. One fluorescent manufacturer saved $10,000 a year and upped production 400% by replacing two-part assembly with a design using a rivet . . . New levels and telescopes are achieving accuracy of 0.0005-in. at 50 ft in production of aircraft wings and fuselages . . . Pneumatic gaging today can divide the inch into millionths; also it can save money. Example: a 20-ton air gage checks fully loaded 90mm rounds. Inspection of 1.8-million rounds cost $90,000 with manual gaging — $14,000 by pneumatic gaging method—saving more than the cost of the machine.

• **WELDING**—Pressure welding is out of the experimental stage and into the shop, where it's effecting savings in labor, time and costs. One tool is similar to pliers but can exert a tremendous pressure on small areas in cold pressure welding of copper and aluminum . . . Special stud, similar to an eyebolt, is "shot" onto galvanized hot water tanks so that they can be handled easily through such operations as pickling, galvanizing and cooling . . . Welding and brazing thus far are the only processes that can be used to fabricate intricate aircraft parts made from high-temperature metals.

• **FISSIONABLE MATERIALS** — can be applied in many ways for gaging and tracing wanted and unwanted elements in a production process. Neatest wrinkle would be attaching radioactive cuffs to workers on presses, so press wouldn't operate if hands were in danger area, and wouldn't work if unauthorized person without cuffs tried to run machine . . . Main problems now lie in inadequate knowledge of safety requirements, and fact that virtually no state in the country has workmen's compensation laws adequate to cope with problems arising from use of nuclear-fission products. Doubtful that atomic power will ever replace conventional fuels in autos, commercial planes, etc.

Over-all Impressions

There was a definite air of "buy and sell" about the Show. Engineers, operating men, and executives were all business. At the panel discussions and technical sessions plenty of notebooks were in evidence — proof that they were at the sessions to learn the newest technological developments and to take them home and apply them in their own shops. And at the Show itself, order books were in evidence everywhere — but customers were taking a second look, and even a third look before buying the equipment needed to help them meet stiffening competition.

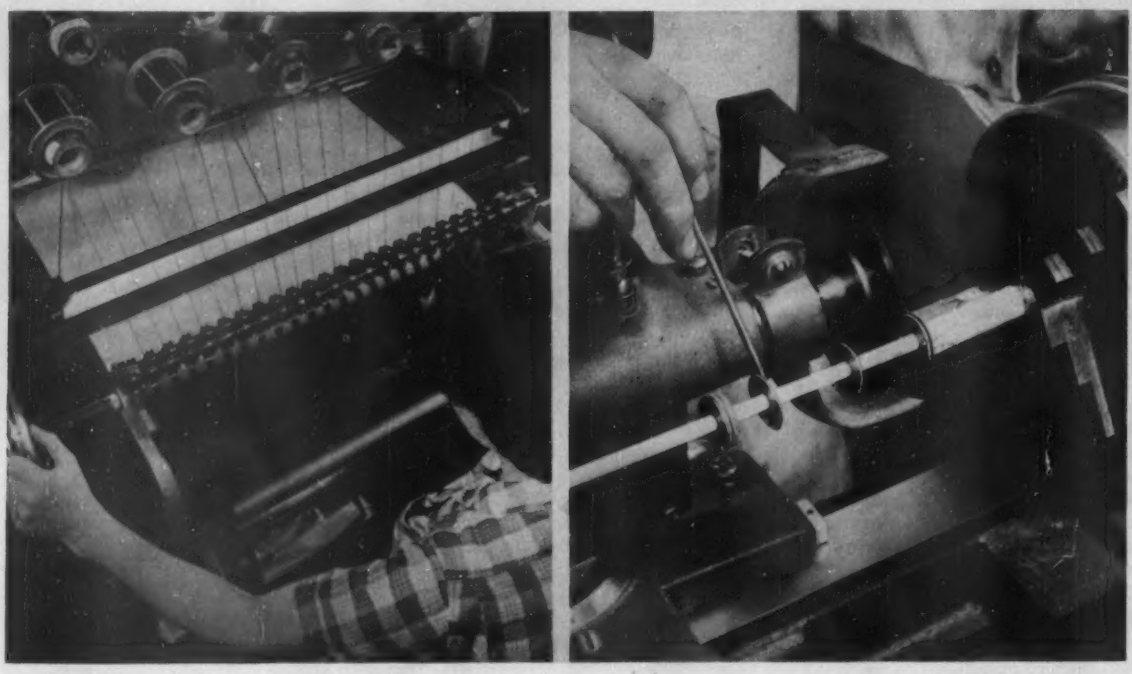
Old . . .

RETIRING PRESIDENT
R F Waindle
Waimet Engineering Co

and New ASTE Officers

NEW PRESIDENT
J P Crosby
Lapointe Machine Tool Co

NEW 1ST VICE PRESIDENT
H B Osborn, Jr
Tocco Div, Ohio Crankshaft Co



AUTOMATION FOR ELECTRONICS is typified by these before-and-after photos from Sylvania Electric Products. Left: the conventional coil-winding machine could make only a few coils at a time, but now (right) a roll of metal foil and insulating paper is sliced into coils of any desired width to produce wafers ready for immediate use

Second Industrial Revolution?

That's what the people who made it possible are calling the trend to automation. And the electronics people are finally getting around to applying it to their own industry with some pretty spectacular results, as reported at recent USAF-Stanford Research Institute Symposium

SAN FRANCISCO — Automation of electronics is essential to US defense because conventional production techniques can't even fill current industrial and domestic demands. This warning by Brig Gen Tom C Rives, USAF Ret, keynoted a joint USAF-Stanford Research Institute Symposium on the Automatic Production of Electronic Equipment held here April 19-20.

General Rives, manager of laboratories for General Electric, said that new equipment cannot be developed by the military alone; it must be financed by both military and commercial funds. "Every dollar spent is a survival dollar," he declared.

More than 400 of the electronics industry's top technicians and operating men—a third of them from the East—agreed wholeheartedly with Gen Rives's opinion, and in two days of intensive discussion explored every means of attaining automation of electronics production.

"Evolutionary" or "Revolutionary"

While the most spectacular work in the field of electronics automation has been done in the Navy-National Bureau of Standards "Project Tinkertoy" (formally titled Modular Design of Electronics and Mechanized Production of Electronics), speakers in general at the Symposium seemed to favor an "evolutionary" rather than "revolutionary" approach.

To this end, Stanford Research Institute's Automatic Factory Research Program, sponsored by the Air Force, tends toward the evolutionary school, —using a line of single-purpose machines that can handle a range of work and materials—machines that can be installed one-by-one in a manual line to permit gradual changeover to automation in a small plant. SRI machines would assemble components of conventional construction but with standardized dimensions, in modular increments of 0.1 in, using feedback control.

"Project Mini-Mech"

Another and similar approach to automation was described by A A Lawson, project engineer, Melpar Inc, Alexandria, Va, whose firm's "Project Mini-Mech" is being carried out under a Navy Bureau of Ships contract.

Melpar's Mini-Mech uses standard components in its punch-tape-controlled assembly line, with a subassembly technique that consists basically of fastening component

"Like a row of penguins, they are all plunging in . . . having needed to hear only the first splash"

boards together in a deck-like manner, mechanically supported by and spaced from adjacent decks by a special combination of male-female connectors. Wiring between components and between decks is eliminated.

A modular coordinate system is used to locate the components. Location is coded digitally and recorded on a storage medium. In this way, a geometrical description of the entire equipment can be obtained by giving a set of component numbers that choose the component type and size, together with another set of numbers giving location of the component.

Thus, Mr Lawson said, a high degree of component accessibility is achieved, because the wafers are easily detachable for inspection and repair. Mr Lawson added that in insertion operations a tool and anvil combine to effect mechanical fastening of the component to the wafer, exclusive of soldering support; then fastening or soldering operations are superimposed. All pertinent conductive surfaces are precoated with solder before entering the assembly machinery, so that soldering is reduced to the controlled and precise application of heat by the forming anvil.

Two Wafers a Minute

Melpar estimates Mini-Mech machines will produce a two-wafer assembly at a rate of two per minute, and that it would be economical to produce as few as 100 units between changeovers.

Another evolutionary process was described at the symposium by Julius Kaplan of Arma Corp, Mineola, LI, NY. Arma's process adapts standard machine tools to punched tape operation by applying recently declassified techniques of feedback control and information handling. This adaptation would permit medium-production industries to employ tools now confined by their inflexibility to volume production.

Productivity can be increased 200-400% for small and medium lot production using Arma's "fleximation" system, Mr Kaplan said. And the cost per machine is reasonable if a small number of machines handle the same type of production.

Mr Kaplan also recommended use of magnetic tape in preference to punched tape because the latter is limited by the mechanical nature of its pickup contacts and by its tendency to accumulate dirt in the holes. And, said Mr Kaplan, magnetic tape is more flexible in that it is equally adaptable to storage of analog and digital information, and can contain more information per unit volume.

Feedback Controls

New York Automation Consultant John Diebold predicted that automatic feedback control automation will have far greater effect on machine-tool design than the Detroit-type of advanced mechanization. Feedback control, he said, is potentially the most significant development of the "second industrial revolution."

(EDITOR'S NOTE: Feedback control is regulation by response of the directing instrument to errors sensed at the directed device. Works the same way as your nervous system. If you reach up to take a lighted cigarette from your mouth and touch the lighted end, the nerves send an SOS to the brain, which sends back an impulse that moves your fingers from the heat to the right part of the cigarette.)

Companies which only a year ago were scoffing at the "dreamers," said Mr Diebold "are today scrambling for leadership. Like a row of penguins on a ridge of ice, they are all plunging in at the same time, having needed only to hear the first splash."

Favors Special Machines

A caution against automatizing standard production machines without careful investigation was offered by E W Leaver of Electronic Associates Ltd, Toronto, who warned that attempts to automatize standard machines by adding facilities "may make them so complicated they will be uneconomic from the standpoint of first cost, maintenance and product flexibility. Favoring the "revolutionary" rather than the "evolutionary" approach to automation, Mr Leaver said he thinks production automata should be designed as automatic machines, not adaptations of workman-operated devices; that they should be completely automatic to avoid collecting disadvantages, and that automaticity should occur at a low level.

The cost of automation was brought up by Dorman D Israel of Emerson Radio & Phonograph Co, who said it is unimportant whether or not the goal for standardizing on single approach to automation of electronics is attained.

"I am 1000% for standardization," Mr Israel said. But, he added, most of the cost of producing electronic equipment, 60-80%, is arrived at in building components by hand assembly methods—not in the final assembly of sub-assemblies and details. Thus redesign of elements and components is more important than a new final assembly technique, he said. Toward this end, Mr Israel's firm is working on development of a conductive adhesive to replace hand soldering operations.

Stress was also laid on the cost factor by N L Harvey of Sylvania Electric Products, who said there are four absolute "musts" in design of automation: (1) no increase in cost of materials or parts can be tolerated, (2) reduction in labor must not be offset by an increase in labor-rated overhead, (3) physical plant facilities must be reduced, and (4) machinery must be standardized for easy changeover from one operation to another.

Mr Harvey said Sylvania has come up with two new developments in production of electronic components. The first is a high-speed automatic technique for making transformer coils (see illustrations) — in which the coils are made by rolling wide sheets of metal foil and insulating paper together: then slicing the roll to form the key element of a transformer, or in the case of radio and TV, the complete transformer.

New Tube Mount

Second development, described by Sylvania's Robert N Palmer, is the design of a receiving tube mount structure for automatic assembly. The new tube mount uses ceramic instead of mica and glass, with the elements stacked on two ceramic pins and separated by ceramic spacers to a thickness tolerance of 0.0005 in. These mounts not only stand up better in shipment, Mr Palmer said —they are rugged under thermal shock and can be subjected to an abrupt change of 300 F without fracturing.

MACHINE-TOOL EXHIBIT SLATED FOR ATLANTA

ATLANTA—In what is claimed by its sponsors, R O Deaderick Co, to be the first show of its kind ever held in the South, more than a dozen prominent US machine tool builders will demonstrate their machines at Atlanta Biltmore Hotel's exhibition hall May 19-21.

Some 40 of the latest developments in machine tools will be shown by: American Tool Works Co, Bridgeport Machines, DeVlieg Machine Co, Cone Automatic Machine Co, Covel Mfg Co, Gisholt Machine Co, Nebel Machine Tool Co, Niagara Machine & Tool Works, Grob Bros, Sheldon Machine Co, Turchan Follower Machine Co, and Van Norman Co.

"No longer," says show sponsor Richard O Deaderick, "is the South a 'machine tool desert'." Strong industrialization movements in recent years have changed that, he says, pointing out that in the period 1940-1953 gross sales of Southern metalworking plants increased 283%. And, he adds, 57% of Southern plants plan to spend $200-million on plant expansion within the next five years.

Pittsburgh Steel Opens Sheet Mill

ALLENPORT, PENNA — Formal opening of a new cold-rolled sheet mill here April 28 marked completion of Pittsburgh Steel Co's four-year, $65-million expansion program, and its entry as a major factor in the sheet steel market.

The new cold-rolled mill is claimed to have the most modern equipment in the steel industry. Located next to Pittsburgh Steel's new hot rolling mill, the four-stand, four-high 66-in. cold mill can roll sheet steel up to 60-in. wide in coils up to 6-ft dia, weighing up to 60,000 lb. The hot and cold mill together cover 15 acres and represent the largest installation of this type to be built in the Pittsburgh area in more than a decade.

12 Annealing Furnaces

New equipment installed at Allenport includes 12 large annealing furnaces, a four-high single-stand temper mill, two flying-shear lines, a slitting line, two re-squaring shears, a power banding unit, and facilities for shipping steel by rail, truck or river barge.

With both the hot and cold rolling mills in operation, production of sheet steel at Allenport could be built up to around 750,000 net tons a year.

Use of automatic, continuous x-ray gages at the finishing end of each mill aids production of sheet to precise tolerances at high rolling speeds.

1.1-Million Tons a Year

Its expansion completed, Pittsburgh Steel has capacity to produce more than 1.1 million net tons of steel products a year—56% sheet steel, 25% seamless tubes, 19% wire products. And expansion of its Monessen, Penna, plant has increased Pittsburgh Steel ingot output to 1.6-million net tons per year.

Pittsburgh Steel President Avery C Adams says the company is now operating at 75% capacity, compared with an industry average of 68%. The steel industry today is sound, Mr Adams said, and steel within a few years may again be in short supply, because metalworking throughout the country is slowly picking up.

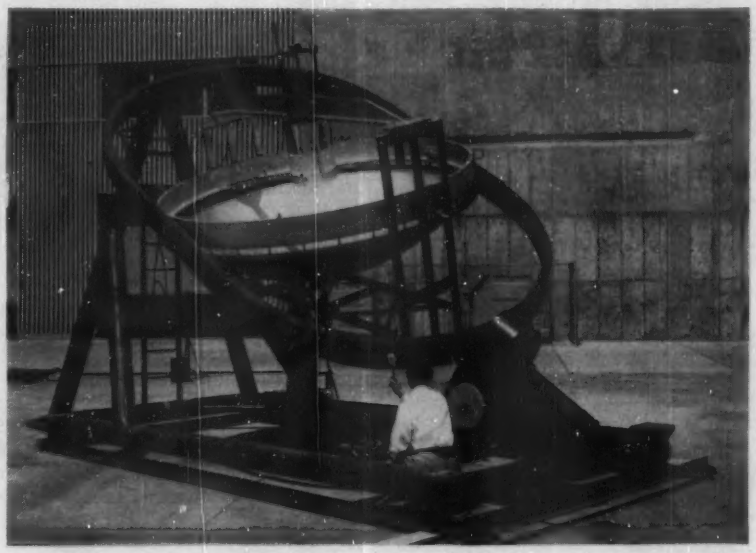
SUN AIDS HEAT TESTING OF METALS, CERAMICS

SAN DIEGO, CALIF—Intense heat that can melt a steel bolt in a matter of seconds is achieved with a solar furnace recently acquired by Consolidated Vultee Aircraft Corp here for research to develop materials that can "break through the thermal barrier" to overcome the internal and external heat problems generated by engines and by friction in today's high-speed jet aircraft.

The furnace was designed and built by Dr Willi Conn of Rockhurst College. Convair acquired it in 1952, re-polished it and added new solar tracking devices.

Material to be tested is enclosed in a quartz envelope and placed within the 120-in. mirror's lead-pencil-sized focal point, where it is subjected to 8500 F, three-quarters of the heat of the sun.

All types of materials are under test, both ceramics and metals, to aid Convair in selecting materials that will meet the aircraft requirements of the future.



Harnessed Sunshine . . . Convair's Solar Furnace Helps

HEAT EQUAL TO 85% OF TEMPERATURE OF SUN'S SURFACE is developed by this solar furnace used for testing aircraft materials at Convair San Diego

Progress Payments Ease Off

Pentagon has relaxed its "hard money" policy decision of last October. Now, both large and small contractors can get US financing of capital equipment expenditures for defense contracts at pre-Korean percentage levels.

WASHINGTON — A new Defense Dept directive declares that responsible contractors may obtain progress payments on certain "types of contracts where progress payments have been traditional without furnishing projections of cash receipts and expenditures."

Reason for the Pentagon's ease-off: industry squawks over the Pentagon's October 1953 "hard money" directive on contract financing policy. This industry interpreted as stating that US financing would be provided only when absolutely necessary, and then only to supplement private financing — after making elaborate justifications.

But now Secretary Wilson says "It is not and has not been the policy of the Dept of Defense that proper use of progress payments be stopped." And, he adds, progress payments shouldn't exceed 90% of direct labor and material costs, or 75% of total cost of work done under the undelivered part of the contract.

Within this frame of reference, the directive says progress payments on long-lead time contracts are considered "reasonably necessary" regardless of a contractor's ability to borrow.

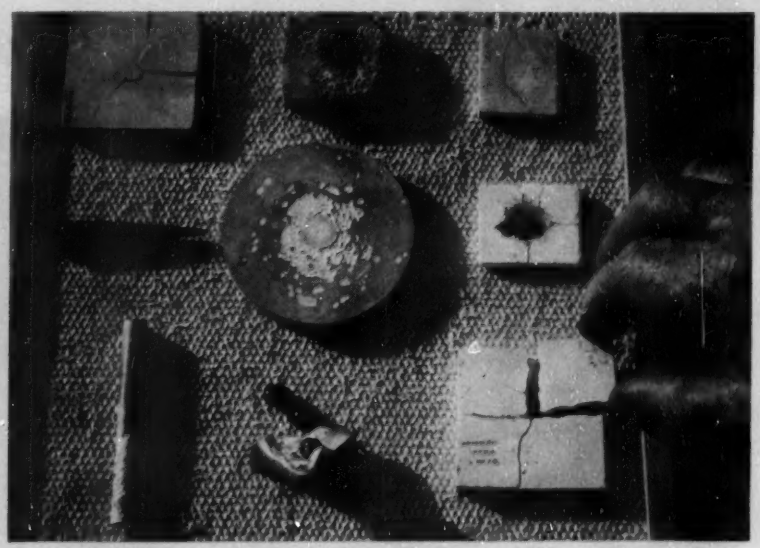
Affects Research, Too

The directive affects both production and research contracts. But progress payments will be discouraged on relatively small contracts (under $1 million) of the stronger and larger contractors. Reason for this is to cut paperwork.

In special cases, percentages larger than the prescribed standards may be necessary. Here again, elaborate justifications will have to be made—special approval, need, non-availability of borrowings, etc. Progress payments may also be obtained in certain cases where pre-delivery expenditures will be large in relation to the contract price and the firm's working capital.

Promotes Conservative Practices

Generally, the new directive restores the standard percentage limits which prevailed prior to the Korean War, instead of the higher percentages which came with wartime industry expansion. It will, however, require a somewhat higher investment of company funds or borrowed funds for new contracts. And it should tend to provide conservative inventory controls and purchasing practices.



. . . using this principle . . . produces 8500 F test heat

Materials Break the Thermal Barrier

FURNACE WORKS SAME WAY as lighting cigarette with reflector

EVEN THE TOUGHEST REFRACTORIES break down under the furnace's intense heat, so high an ordinary furnace would burn itself up

New Englanders Talk Replacement

. . . find they could save $1 billion a year in production costs by replacing over-age machine tools with new. And they could improve their competitive picture in the national metalworking market, too.

BOSTON—New England, the area that has more machine tools installed in its metalworking plants than any other area in the United States, must replace its obsolete machine tools with new ones to meet an era of stiffening competition. That is the opinion of the region's top machine-tool builders and metalworking executives, who met here April 22 for the New England Council's 6th Industrial Opportunity Conference.

All that is needed to speed up modernization today is for the government to revise the unsound depreciation policies that have held it back for years, Alfred V Bodine, president, Bodine Corp, Bridgeport, Conn, told the New England industrialists. When inflation is piled on top of the unrealism of Bulletin F, he added, the result is that only a small share of the cost of new equipment can be met by depreciation accumulated on the machines to be replaced. Thus most of the cost of modernization must be met out of earnings after taxes. The remedy, Mr Bodine said, is to stop using depreciation as means of tax revenue and "return to the concept of depreciation as a matter having to do with the recovery of capital."

Optional depreciation as a long term objective, Mr Bodine continued, has been recognized to a limited extent in Section 167 of HR 8300, proposed Internal Revenue Code of 1954. Under it, taxpayers may adopt a declining-balance depreciation method that will allow them to recover about two-thirds of the cost of a machine in half its useful life. This, Mr Bodine said, would increase, not decrease, Federal income.

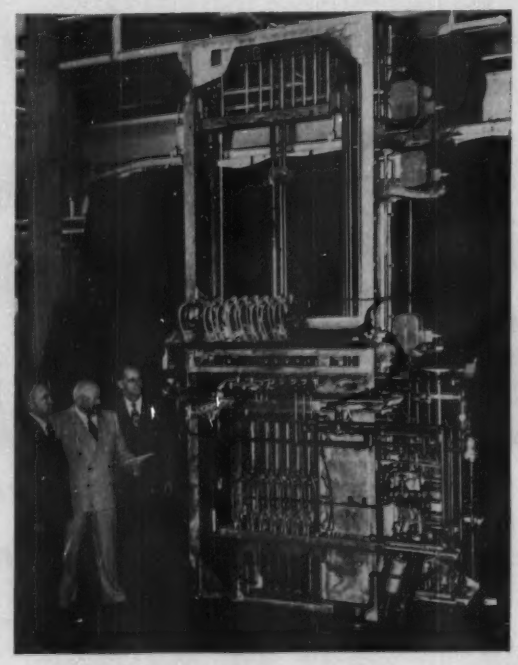
If you are interested in establishing a real replacement policy in your plant, you should do two things, Henry D Sharpe, Jr, president of the Brown & Sharpe Mfg Co, Providence, R I, told the conference. First is to educate yourself and your staff about replacement plans and formulas. You should consider the experience of other companies and also have ideas of your own too. Second is to give consideration to the "major-surgery" approach.

Only three common methods of machine replacement are now in use, Mr. Sharpe emphasized. One is the assessment of a machine's worth based on its age. Another is how many years it takes for a machine to pay off its cost. The third is the MAPI formula—and this is the dynamic equipment policy approach. It assures replacement in the light of analysis of economic facts.

The "years-to-payoff" method probably is the most popular rule-of-thumb for determining replacement, Mr Sharpe said. Its simpliciy recommends it. It also is a realistic way of doing the job when only limited funds are at hand. But it has its drawbacks. It gives no definite signal when to replace, dependence being put upon management's judgment. It does not reveal the definite dollar cost of not replacing old equipment. There is a tendency of this short payoff method to shield an old machine from retirement.

Horace H Baudet of Draper Corp's planning department said his company originates re-equipment studies by (1) making an annual equipment survey, (2) maintains a constant methods-improvement program, and (3) investigates all suggestions made by the line organization. This procedure, he said, makes long-range planning possible, yet is flexible enough to care for current needs.

One out of every four machine tools in New England plants are more than 20 years old, and three out of five are 10 years old or older, Burnham Finney, editor *American Machinist*, told the group. "Metalworking is New England's largest industry today . . . and New England's factories contain one-sixth of the nation's machine tools," Mr. Finney said, adding that the area's metalworking industries could cut production costs as much as $1 billion a year and at the same time improve their competitive position compared with the rest of the United States.



ATOM SUB TESTER. This giant machine, built by John S Barnes Corp, Rockford, Ill, will be used to clean and check radioactive rods installed in a prototype of a second atomic-powered submarine. Giving it a final check before shipment to a GE test site near Schenectady are, from left, Designer Joseph Phillips, Executive Vice President Ernest J Svenson, and Al Marxman, who helped build the unit

Optimistic Outlook Keynotes NSMPA Meeting

DETROIT—Although total industry sales have plummeted from $550 million in 1952 and 1953 to a projected total of $350 million this year, no despair was evident among representatives of 100 companies attending the 21st annual meeting of the National Screw Machine Products Assn April 21-23.

"There is no pessimism in this group and no stampeding," NSMPA Executive Secretary Orrin B Werntz told reporters. "We are talking realistically of increased competition, lowered volumes, better selling, better engineering, and economy of operation."

Mr Werntz added that the projected drop in gross sales comes as no surprise, because about 30% of industry capacity was devoted to Korean defense work.

And things are looking brighter—for the first time in six months, inquiries, orders and shipments increased in March. With the exception of next June and July, when volume is expected to be down, spokesmen for the industry feel this is the low point and that things will pick up from here on out. Over the last six months, average hours worked by employees dropped from 49 hours a week to 41.7 hours.

Tour Ford Plant

Top attraction of the three-day meeting was a tour of Ford Motor Co, and a luncheon at Dearborn Inn, followed by a visit to the Henry Ford Museum and Greenfield Village. Luncheon speaker Stanley W Ostrander, Ford vice president and group executive, gave NSMPA members an insight into Ford's business goals and expansion plans for the future.

Delegates elected the following new NSMPA officers: president, William N Grass, M J Grass Screw Machine Products Co, Buffalo; vice president, Ernest W Schneider, Hudson Screw Machine Products Co, Chicago; treasurer, Charles D Hoyt, Jr, Charles D Hoyt, Inc, Mishawaka, Ind; executive secretary, Orrin B Werntz; and secretary, Margaret S Ballinger.

NSMPA's next annual meeting is scheduled for Buffalo in May 1955.

ABOVE: (left) husband and wife Mary and Harold Noyes have 80 years' service between them; (center) brothers and sisters Herman, Agnes Roth Knechtel, Laura and Richard Roth, total service 151 years; (right) father and son Alexander and Duncan Cameron, 69 years' service

BELOW: (left) President Arthur H Starrett, himself a 50-year veteran, congratulates brothers Harry and Charles Hoehn on their combined 109 years' service; (center) brothers Edward, William and John Metevias, combined service, 95 years; (right) husband and wife Ruby and Albert Downing total 77 years' service

Veteran Machine Tool Families Honored at 25-Year Banquet

ATHOL, MASS — Several "Starrett families" were among the 25-year veterans honored at a banquet given recently by the L S Starrett Co here. Total club membership numbers about 200—54 retired members and 145 active. New 25-year members and 50-year members were presented with US saving bonds or watches by President Arthur H Starrett, who in turn received a watch honoring his 50 years' service.

DUTCH MACHINE TOOL BUILDERS TO MERGE

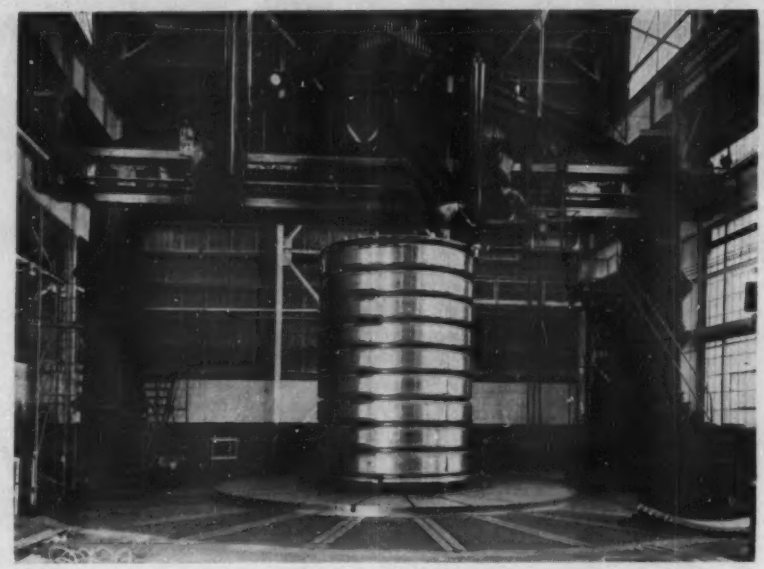
AMSTERDAM (McGraw-Hill World News)—The Netherlands' two largest machine tool building companies, N V Werkspoor of Amsterdam, and Royal Machine Factory Stork Bros & Co of Hengelo, recently announced that they will merge into a single, giant combine.

Capital: $7-8 Million

Offshoot of the merger will be a new company, financed by the combined capital of the two merging organizations. The new firm will be capitalized at 32-million guilders ($7-$8 million) and will be The Netherlands' fourth largest industrial concern. The others: Royal Dutch Shell, Unilever Corp, Philips.) N V Werkspoor has a payroll of 10,000 employees, Stork 8000—most or all of whom will be retained, according to company officials.

Object: More Exports

The merger is aimed at specialization of production and increasing exports of machine tools.



Cutting a 150-Ton Job on a 42-Ft Vertical Borer

RAISED TO ITS HIGHEST CUTTING ELEVATION to machine a 150-ton air compressor rotor assembly is this 42-ft vertical boring mill at S Morgan Smith Co's York, Pa, plant. Compressor, which will be used in a wind tunnel at the Lewis Flight Propulsion Laboratory, Cleveland, had to be machined so accurately that the total net runout of the assembly was within 0.002 in.

USED MACHINERY: Will Taxes Rock the Boat?

They will, says the Machinery Dealers' National Assn —if the government doesn't re-revise its new tax bill to provide more equity between new and used machine write-offs

WASHINGTON—A vigorous effort to have used machines treated in the same way as new ones under the new tax revision bill has been started here by the Machinery Dealers' National Association.

MDNA's protests center around the House version of the bill, which grants faster write-offs for new machinery, but denies fast write-offs for used, rebuilt or reconditioned machinery. The fight was recently carried to the Senate Finance Committee by Richard M Nathans, president, and R K Vinson, executive director of the association.

The heart of their argument was that tax treatment more favorable to new machinery than to used would disrupt normal relationships existing in the machinery business. They argued that many small businesses started first with used equipment, and should not be put at a disadvantage compared to well-established firms.

The issue is whether used machinery should come under the declining balance method of depreciation. President Eisenhower approved the idea as a way of stimulating investment, and the White House wrote it into the Tax Revision Bill. It allows the purchaser of a piece of new equipment costing, say, $10,000 and having a 10-year-life for tax purposes to write off $2000 the first year.

But a buyer of a piece of used machinery, also costing $10,000, would be forced to stick by the present method and could write off only $1000 the first year.

The declining balance method allows two-thirds of the cost of a product to be depreciated in half its useful life. In the case of a new machine costing $10,000 and having a 10-year useful life, this would mean $6700 could be written off in five years. But in the same period, the used machine buyer could write off only $5000 on a machine of equal value.

It is not clear why the House bill excluded used products from the declining balance method of depreciation. One theory is that it feared tax avoidance schemes, particularly in the form of dummy sales of buildings. MDNA officials have pointed out to the Treasury's tax experts that this could hardly be a consideration with used machinery.

If used machinery does finally get the declining balance treatment, it will have to be through Senate action. If the Senate approves, the issue will have to be threshed out in a House-Senate conference. Chances of its adoption look fairly good, but are by no means certain.

Judson S Sayre

Paul K Rogers, Jr

Frederick W McIntyre, Jr

Names in the News . . .

Judson S Sayre has been made president and general manager of the Norge Division of Borg-Warner Corp, and a vice president of Borg-Warner. He succeeds **George P F Smith,** who is joining the executive staff of the B-W central office. Mr Sayre has been president of Bendix Home Appliances, Inc, since 1941; he was named general manager when the organization became a division of Avco Mfg Corp, in 1950, and the following year was elected vice president of Avco. He has also held the posts of national sales manager of Kelvinator Corp, head of Montgomery Ward's appliance division, and assistant to the president, RCA.

John D Humphreys has been promoted to the post of assistant chief engineer of Cincinnati Lathe & Tool Co. A member of the engineerng department, Mr Humphreys has been associated with machine tool design, production, and sales activities for the past eight years.

Paul K Rogers, Jr, vice president of the Skinner Chuck Co, and Skinner Valve Div, has been elected president of the company. He succeeds **Arthur E Thornton,** named chairman of the board. Mr Thornton, a member of the firm for 39 years, has been its chief executive since 1938. Mr. Rogers, who will continue to serve as treasurer, was formerly associated with Jones & Lamson Machine Co.

OBITUARY

Philip Otto Geier, 77, treasurer and chairman of the board of The Cincinnati Milling Machine Co until his retirement in 1946, died in Tucson, Ariz, April 20. Mr Geier, a brother of the founder of the company, had been associated with Cincinnati for 47 years. He was made treasurer in 1911 and board chairman in 1934, and held both offices until he retired; he continued as a director of the company until 1952.

Frederick W McIntyre, Jr, has been elected president of Reed-Prentice Corp. Formerly vice presilent, he succeeds **Frederick W McIntyre, Sr,** head of the company since 1944, now named chairman of the board. **Donald H Dalbeck,** corporation treasurer, has been elected a director and vice president. **Iver G Freeman,** associated with the Norton Co, Worcester, Mass, for the past 38 years has been named a Reed-Prentice vice president.

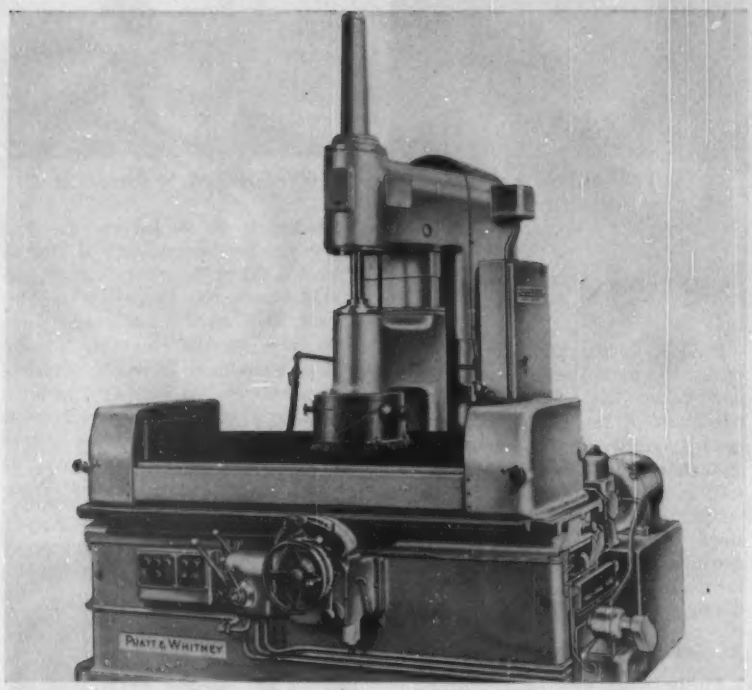
CHARLES W DEEDS, president of Niles-Bement-Pond Co from 1943-1947, has been elected chairman of the board

C HAROLD ANDERSON, newly-named chief engineer of The Bullard Co, Bridgeport, Conn, who was erroneously identified as **PHIL C HEWETT,** *AM,* April 12 '54, p261

PHIL C HEWETT, appointed sales manager, Special Machine Tool Div, Cincinnati Milling & Grinding Machines, Inc, whose picture was omitted in error, *AM,* April 12 '54, p261

RICHARD W BANFIELD, named executive vice president, Niles-Bement-Pond Co. He will continue to serve as manager, Pratt & Whitney Cutting Tool & Gage Divs

New Shop Equipment,



Pratt & Whitney Surface Grinder Features Rigid Design, High Speed

This 14-in. hydraulic vertical surface grinder is available in 14x36 or 14x60-in. size with solid ring wheel. With segmental wheel, sizes are 17x36 and 17x60 in.

Increased length and depth of heavily ribbed bed of this Model D give greater support to table and column. Wider wheelhead ways and increase in column bearing length provide spindle head with additional support. Spindle is heavier with more rigid bearing construction; wheel flange is integral part of spindle.

Higher table speeds, infinitely variable and uniform from 2 to 100 fpm permit use of harder wheels. Table traverse is operated by two hydraulic cylinders with speed controlled by metering oil in return lines. Hydraulic system consists of 50-gal. reservoir equipped with 30-gpm variable-delivery pump having automatic control that meters flow according to speed desired.

Power is provided by 30-hp motor. Full power is transmitted to wheel through specially developed spiral bevel gears, of hardened nickel steel and running in oil.

Other features include: positive lubrication to table ways by continuous automatic pressure system; general lubrication by one-shot lubricator; and power indicator mounted on spindle. Both electrically and hydraulically, design meets JIC standards.

Pratt & Whitney, Div Niles-Bement-Pond Co, West Hartford 1, Conn

Cutoff Blades

Cutoff blades of special alloy steel of tungsten, chromium, cobalt, carbide, and other metals. Said by maker to allow as much as double normal HSS cutoff tool speed. Initial hardness of tools is 60-63 R_c.

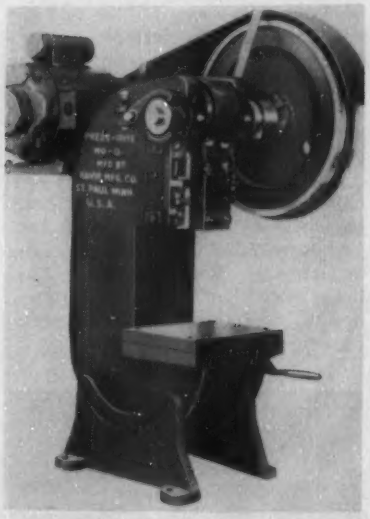
American Cam Co, Inc, Hartford 1, Conn

Wales Liquid Springs Use Special Silicones

Wales states that through the use of special silicones provided by General Electric research, the efficiency of Hydra springs has been increased to 1000% over coil springs. Liquids formerly used provided compressibility of 6.2% at 20,000 psi, the maximum operating pressure of the spring.

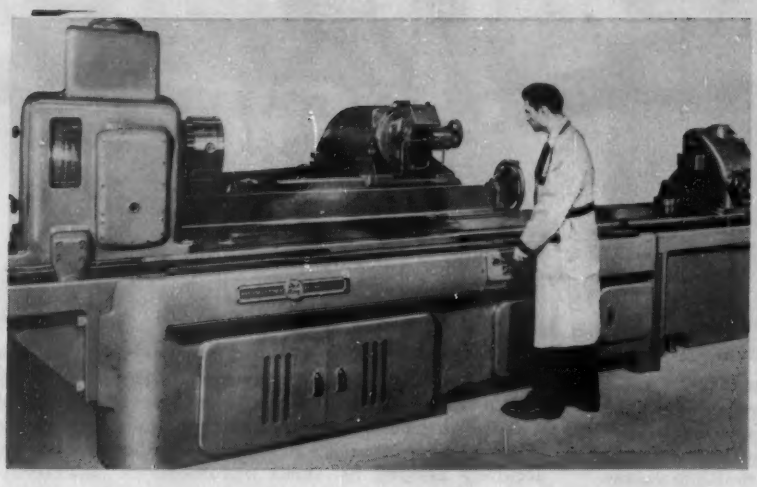
With the new silicone liquids, compressibility has been raised to as high as 12% at 20,000 psi. Effect of this gain is to produce twice the force or stroke for the same size spring. Wales hole-punching units which formerly were capable of punching and stripping only ¼-in. material will now handle up to ¾-in. thickness.

Wales-Strippit Corporation, 345 Payne Ave, N Tonawanda, NY



PRESS-RITE PRESS No. 0 features heavy-duty bronze bushings in flywheel and heavy bronze wear plates in ramway, as well as new heavy-duty clutch. This press is the smallest of the Press-Rite line which ranges from 5 to 85 tons. It is reported to have most of the heavy construction features of other members of the line, including high-tensile-alloy cast reinforced frame, single-stroke safety mechanism, and knock-out bar in slide—*Sales Service Machine Tool Co, St Paul, Minn*

Materials and Parts . . .



Horizontal Gear-Shaving Machine Handles Spur and Helical Gears

Red Ring model GCJ-36 finishes teeth on spur and helical gears with up to 36-in. pitch diameter and having shafts up to 142 in. long. It is equipped with power-driven headstock and center tailstock traversed by rack and pinions.

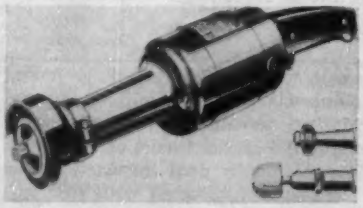
Crowning of tooth surfaces on spur and helical gears up to 12 in. wide with shafts to 62 in. long can also be done.

Machine allows for mounting assemblies on shaft centers or can be equipped with work driver to enable gears to be shaved while rotating on the journals on which they will run.

Surfaces are finished by crossed-axes principle. Gear is rotated in mesh and drives gear shaving cutter set at crossed axes to gear centerline. Serrated-tooth cutter is traversed back and forth across tooth face while being fed in selective increments. Nine and twelve-inch-diameter cutters are used on this machine.

A 5-hp motor drives headstock through a worm-gear drive and change gears. Power crossfeed for cutter slide is provided by 3-hp motor driving through reduction gearing, change gears, and leadscrew and nut arrangement. Two speeds are provided by this drive, one for traverse and one for feed. A ¼-hp motor drives an integral coolant pump in the machine. A guard rides on rails at front of machine.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich



Dumore Series 9 Heavy-Duty Handgrinder

Series 9 handgrinder is recommended for cleaning casting and weld seams, spark testing steel, and polishing and grinding heavy and irregular work. Chuck of ¼-in. capacity is furnished for use with mounted wheels in grinding tight spots, radii, and die molds.

Rifle-type grip provides easy operation. A ¼-hp continuous-duty-rated universal motor develops 15,500 rpm. Three precision bearings are seated in steel inserts.

Dumore Precision Tools, The Dumore Co, 1300 Seventeenth St, Racine, Wis

. . . INCLUDING

Surface grinder for toolroom or small-part production has small increments of downfeed, wide increments of crossfeed . . . . page 200

Wheelforming attachment was designed to simplify form-truing of grinding wheels up to 14 in. in dia . . . . . page 201

Rotating templet drive is incorporated in fluid tracer lathe for machining radial, as well as axial, contours . . . . . page 204

Telescoping sleeves obtain minimum close-down length through controlled convolution diameters page 212

Flange-rolling machine will roll 0.120-in.-thick aluminum without requiring special dies . . . . page 214

Engraving machine has portable chassis which may be lifted off base and set on work surface page 220

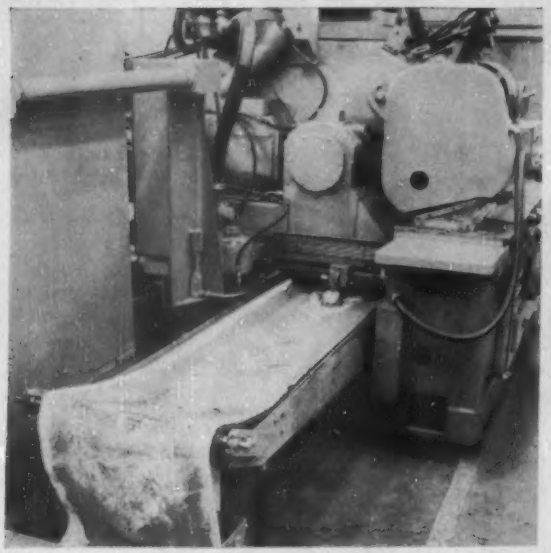
Rotary surface grinder has two rotary magnet tables carried on knees in front of bed . . . . page 228

Universal die-sinking machine produces irregular-form molds and dies in two or three dimensions . . . . . page 230

. . . and in May 24

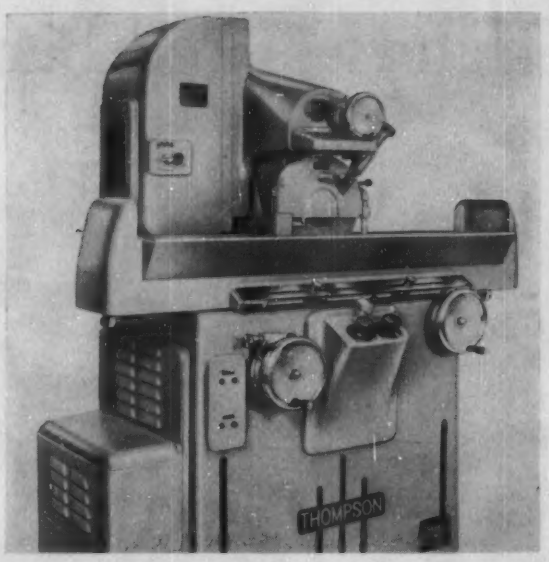
Double-end screw machine works front and back of pieces in one complete cycle.

Compacting press is mechanical four-column type with pneumatic clutch and brake.



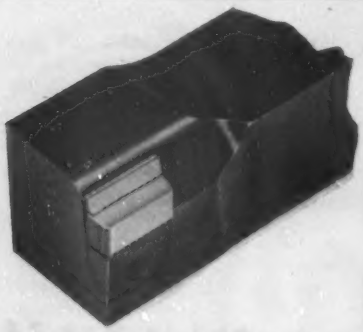
MULTI-WHEEL GRINDER, Norton type CM-1 (*AM*—Dec 21, '53, p 149) had as one of its development problems the elimination of the grinding swarf produced by several grinding wheels cutting simultaneously. In a single plunge grind, the wheels grind multiple diameters which may be of different dimensions. Normally the downtime required to remove grinding sludge from these wheels would be considerable. To provide continuous and automatic sludge removal, Norton engineers adapted certain components of the Delpark filter made by the Industrial Filtration Company of Lebanon, Indiana. This unit consists of an endless chain-belt-type conveyor on which rides a strip of disposable filter material. The conveyor forms a trough into which used coolant falls. As the filter medium becomes loaded, a float control advances the conveyor to bring clean filter material into position. Swarf which has been filtered is collected from filter medium in metal receptacle for easy disposal.

Norton Co, Worcester 6, Mass



SURFACE GRINDER, type F, for toolroom or small-part production, has following features: crossfeeding wheelhead grinding with periphery; rapid positioning of work; in-position wheel truing; simplified controls; accuracy assured by small increments of downfeed with wide increments of crossfeed at 70 fpm table speed, fast spark-out; flame-hardened and ground bed ways with no work-surface overhang; flame-hardened cross-slide ways; integral motor drive to spindle, 1800/3600 rpm; 1½-hp motor with safety interlock to permit use of 7 or 12-in.-dia wheel; low-pressure hydraulic system; automatic table lubrication; built-in coolant system; manual crossfeed; simplified electrical panel. With the micrometer stop previously sized, work may be placed back on chuck and up to 0.0001 in. of stock may be removed. Available accessories include: automatic downfeed; dust exhauster, coolant-through wheel; Hoglund Magniform contour dressers; Delpark filter with automatic sludge removal.

Thompson Grinder Co, Springfield, Ohio



Inserted-Carbide Tool Has Adjustable Chipbreaker

Viking inserted-carbide straight turning tool incorporates an independent, adjustable chipbreaker. Inserted element has bottom serrations and is inserted in broached slot. Hardened tool steel serrated semi-cylindrical wedge lock is located underneath carbide insert, locking it and chipbreaker block simultaneously. Mating serrations provide positive holding to resist thrust of cut. Lock is actuated by dual threaded screw.

Insert is fabricated with just sufficient steel at bottom to provide economical application of serrations without applying bi-metal strain to brazed carbide tip. Relative heavy cross section of carbide tip and thin section of steel allows carbide to remain dominant element of toolbit and eliminates carbide fracturing from brazing strains. Bit is also provided with steel extension at rear of tip.

The chip control block is provided with fine-pitch adjusting screw contacting rear of block. Infinite adjustment can be made to meet all requirements. Important feature of design is surface-to-surface contact of chip control block and top of carbide toolbit.

The Viking Tool Co, Shelton, Conn

Parker Industrial Hydraulic Accumulator

Piston-type industrial hydraulic accumulator furnishes hydraulic power at extremely high oil flow for relatively short cycles of operation intermittently. Accumulator can function as: auxiliary source of energy, emergency source of fluid power for operation of secondary system; surge chamber or shock absorber; leakage compensator in closed or pressure-regulated circuit; thermal-expansion compensator; dispenser of fluids under pressure.

Eleven sizes are available with bore sizes of 1½, 4, and 7 in. and lengths from 8⅜ to 40 in. Operating pressure rating is 3000 psi; oil volume capacities range from 10 to 1155 in.

Industrial Hydraulics Div, The Parker Appliance Co, 17325 Euclid Ave, Cleveland 12, Ohio

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 GEAR LAPPERS—*Michigan Tool Co, Detroit 12, Mich.* 8-page bulletin No. ML-54 contains illustrated data on external and internal machines. Contains explanation of lapping process, and discussion of problems and solutions.

2 AIR CHUCKS—*Whiton Machine Co, New London, Conn.* 8-page brochure illustrates wedge and lever-actuated units. Describes Micro Jaw-Set for precision adjustment of chucks with American Standard serrated jaws. Features of air cylinders and other accessories included.

3 HYDRAULIC OVERLOAD PITMAN —*Dayton Rogers Mfg Co, Minneapolis 7, Minn.* 4-page form 205 provides facts, specifications, operational data, on connecting member for crankshaft presses.

4 HP-CAPACITY FOR TEXROPE V-BELT DRIVES — *Allis Chalmers Mfg Co, Milwaukee, Wis.* 6-page bulletin 20B6956B gives information on new method of calculating. Provides means of determining ratings for both standard construction and high capacity Texrope V-belts.

5 PRESSURE PROCESSING EQUIPMENT—*Hydraulic Press Mfg Co, Mount Gilead, Ohio.* 4-page bulletin 5401 lists 19 different types of hydraulic presses and machines, plus line of components. Each unit illustrated, with summary of its uses and sizes.

6 POWER CHUCKING EQUIPMENT —*S-P Mfg Corp, Cleveland 6, Ohio.* 32-page catalog 105 illustrates line of self-centering units with cam and lever action. Covers new compensating power chuck with floating cam. Sections included on rotating air cylinders, air valves, and accessories.

7 SPINDLE BEARING MANUAL—*United Motors Service Div, General Motors, Detroit 2, Mich.* 32-page manual illustrates and details both dismounting and assembly of 10 typical ball bearing supported spindles. Outlines principles involved in maintenance for doing high precision work.

8 TUBE BENDING PRESS — *Pines Engrg Co, Aurora, Ill.* 4-page illustrated bulletin describes mechanical features of 20-ton hydraulic unit for handling pipe and tube sizes up to 2 in. OD x 0.083 wall. Applications and specifications included.

9 CIRCULAR AND DIAMETRAL PITCH KNURLING — *Reed Rolled Thread Die Co, Worcester 1, Mass.* 21-page booklet, Knurl Data 50-10, contains condensed technical information on process and its use. Includes data on knurling on screw machines and lathes, and thread rolling machines. Illustrated with tables, charts, formulas.

10 HORIZONTAL SHAVING MACHINES—*National Broach & Machine Co, Detroit 12, Mich.* 16-page illustrated catalog S-54-2 describes Red Ring units for large external gears. Contains operating and application data on three models, with specification and capacity table.

11 SMALL HOLE TAPPING MACHINE—*Hamilton Tool Co, Hamilton, Ohio.* 4-page bulletin T-54 contains illustrated information on features of super-sensitive precision unit. Specifications included.

12 RAM-PRESS BROACHING MACHINE—*Colonial Broach Co, Harper Station, Detroit 13, Mich.* 4-page bulletin RP-54 features special surface-broaching installations. Automatic and semi-automatic fixtures, hydraulic clamping and multiple broach setups illustrated. Specifications and dimensions of machine line included.

13 OPEN BACK INCLINABLE PRESSES—*Niagara Machine & Tool Works, Buffalo 11, NY.* 20-page bulletin 57A describes features of Series AA. Specification tables and die space dimensions for the 8-press line included.

14 MILLING MACHINES—*Sundstrand Machine Tool Co, Rockford, Ill.* 12-page illustrated circular on Model 66 Rigidmil shows typical uses, features, machine cycles, and specifications.

15 AUTOMATIC SCREW MACHINES —*Cleveland Automatic Machine Co, Cincinnati 12, Ohio.* 8-page bulletin illustrates single spindle units. Contains applications, specifications and features; includes dialmatic models.

16 COMPACTING PRESS — *Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa.* 4-page bulletin 3104 describes Model

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Title .....
Company .....
Co. Address .....
.....
AMERICAN MACHINIST, New York

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L, 50-ton powdered metal press. Design specifications listed; table of features explains how press is designed for low-cost production.

17 METALWORKING POWER TOOLS — *Delta Power Tool Div, Rockwell Mfg Co, Pittsburgh 3, Pa.* Folder contains illustrated data on portable tools for a variety of production applications. Includes drill-presses, bandsaws, finishing machines, shapers, grinders, welders, and accessories.

18 STRIP FEED PRESS — *Baldwin-Lima-Hamilton Corp, Hamilton, Ohio.* 4-page bulletin 1352 describes No. 401 Hamilton unit for single and multi-die operations. Design, operation, and specifications given.

19 GEARGRIND MACHINES — *Gear Grinding Machine Co, Detroit 11, Mich.* 8-page illustrated catalog provides complete data on entire line, as well as types and specifications of gears, splines, and special-contoured parts that can be ground on them. Request on company letterhead.

20 TRAUB AUTOMATICS — *Guthery Machine Tool Corp, New York 36, N.Y.* 32-page catalog contains detailed description of the design, construction, specifications, applications, and of attachments and tooling available. Samples of parts made illustrated.

21 POWER PRESS BRAKES — *Airtherm Mfg Co, St Louis 10, Mo.* 16-page booklet on Metalworker line gives specifications on six series for sheet metal and plate. Applications possible with various dies illustrated; optional features described.

22 LATHEMASTER—*Marvie Inc, San Mateo, Calif.* 6-page folder illustrates 4-faced tool block and five basic toolholders which may be fitted quickly to any engine lathe. Applications pictured, specifications, and prices listed.

23 IRON HAND AUTOMATIC UNLOADING MACHINES—*Sahlin Engrg Co, Birmingham, Mich.* 16-page brochure describes and illustrates various designs of units for presses. Swinging arm and floor-type machines included, plus six designs of special-purpose gripping jaws. 8-page catalog 10 gives operating instructions and parts lists for machines, major assemblies, and jaws. Request direct from company.

TOOLS AND ACCESSORIES

24 HOLDING TOOLS—*Wilton Tool Mfg Co, Chicago 14, Ill.* General Catalog 100 describes line of vises, clamps, and positioning devices. Contains index, cross-sectional drawings, and cross-reference charts of competitive lines. Includes new line of lower-priced vises, and power-operated automatic units.

25 ABRASIVES — *Sandusky Abrasive Wheel Co of Ill, Inc, Kalamazoo 11, Mich.* 9-page catalog 100 illustrates data on grinding and polishing, cutoff, and mounted wheels, and abrasive sticks and blocks. Operating speeds, ordering information, size charts included.

26 OSCILLOGRAPHIC RECORDING SYSTEMS—*Sanborn Co, Industrial Div, Cambridge 39, Mass.* 38-page catalog describes systems and accessories for accurate recording of phenomena with frequency spectrum within the range of 0 to 100 cps. Includes illustrations, technical data and specifications for four, two, and one-channel recorders, as well as the versatile 150 series system.

27 SYNCHRO-LECTRIC VISCOMETER —*Brookfield Engrg Laboratories, Stoughton Mass.* 21-page booklet "Solutions to Sticky Problems" deals with how device works, viscosity and temperature, rheology, flow, and similar subjects.

28 CLAMPS—*Cincinnati Tool Co, Cincinnati 18, Ohio.* Catalog C-50 furnishes selection and application information on all types.

29 GRINDING OILS—*D A Stuart Oil Co, Ltd, Chicago, Ill.* 16-page brochure covers characteristics and functions of seven products, with applications and specific recommendations for use in grinding and honing operations where very high surface finish is required.

30 OPTICAL FORM GRINDER PROJECTOR-COMPARATOR — *Portman Instrument Co, New Rochelle, NY.* 8-page catalog illustrates Model OFG-200 dual-purpose unit. Presents operational data, accessories, specifications, and dimensions.

31 MILLING SPEEDS AND FEEDS—*Clarkson, Inc, Toledo 6, Ohio.* Operator's slide rule available; readings given for tough and medium steel, cast iron, phosphorous, bronze, mild steel, brass, and aluminum.

HEAT TREATING AND WELDING

32 HEAT TREATING ALUMINUM ALLOYS—*Reynolds Metals Co, Louisville, Ky.* 121-page manual contains nontechnical section on underlying principles, and a section for the metallurgist with full technical details. Glossary of terms, processing data in tabular form, tables of mechanical properties produced by various heat treatments included. Request company direct by letter.

33 WELDING ACCESSORIES—*Metal & Thermit Corp, New York 17, NY.* 20-page illustrated 1954 catalog covers electrode holders, helmets, ground clamps, tools, cable, and related products.

PARTS AND MATERIALS

34 GLASS FIBER LAMINATES—*Luna Laminates Inc, Huntington Station, Long Island, NY.* 24-page brochure "Glass Fiber Laminates for Shell Structures" is a comprehensive study of subject. Equations, diagrams, and charts point out advantages of these materials over metal or wood construction.

35 ALLOY STEELS — *Climax Molybdenum Co, New York 36, NY.* 208-page book, "Alloy Steels Pay Off," contains a 29-page introduction with charts outlining advantages, 172 pages of case histories, and a 5-page reference section.

36 FREE CUTTING BRASS — *Titan Metal Mfg Co, Bellefonte, Pa.* 48-page booklet compares machinability with that of leaded steel. Pieces of both, and wear on cutting tools are compared. Charts, diagrams, and photos, plus scientific data on production tests included.

37 STEEL SCREWS—*Mac-it Screw Div, Strong, Carlisle & Hammond Co, Cleveland, Ohio.* 36-page catalog 50 contains an illustrated index, complete data on physical characteristics, charts for sizes and list prices.

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Portable Attachment Forms Medium-Sized Wheels

Diaform wheelforming attachment is designed to simplify form-truing of grinding wheels up to 14 in. in dia, used for grinding dies, punches, flat or circular forming tools, and similar forms. Capacity is up to 2 in. wide and 1 in. deep in one setting.

Basic construction is vertical pantograph, operated by tracing templet to guide a truing diamond across the face of the grinding wheel on 5 to 1 ratio. Attachment is portable and may be placed on magnetic chuck or strapped to table of grinder. Two diamonds mounted in tandem are used to true the grinding wheel—one for roughing, the other a finishing diamond. Centering gage is provided to center each diamond.

Tool is made in two models: 2A for clockwise wheel rotation and 2B for counterclockwise rotation.

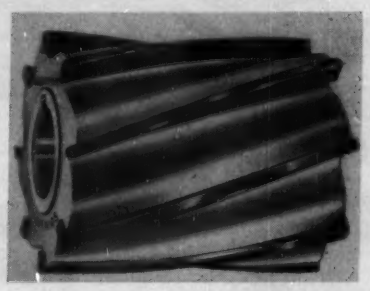
Pratt & Whitney, Div Niles-Bement-Pond & Co, West Hartford 1, Conn

New Models of Turbo-Blast Machines

Parts cleaning machines range in size from 20-gal. solution capacity to 2300 gal. for applications in cleaning, degreasing, and stripping. All models are equipped with impellers which create a violent, fast-cleaning scrubbing action. Some models are equipped with baffle plate covers to permit powerful agitation with two-layer stratified cleaning materials.

Turbo-Blast units are heated by steam, fuel oil, natural or manufactured gas, thermostatically controlled for effective and economical use. Existing models meet most industrial and maintenance requirements, but special cleaning systems can be devised, such as conveyorized systems, with varying patterns and fluid application.

Storm-Vulcan, Inc, 2225 Burbank, Dallas, Texas



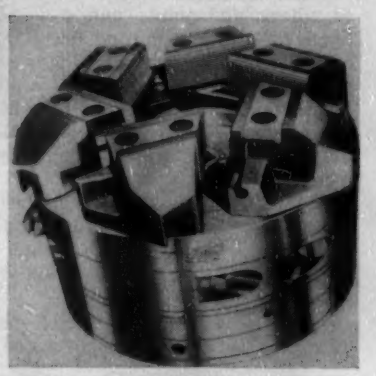
Helicarb Slab Mills For Heavy Duty

Helicarb helical-carbide slab mill recently developed for heavy stock removal on wide slab cuts, is said to combine efficient cutting action of true helical flute design with hardness of carbide. Now standard carbide cutters are available with proper composite cutting angle established and held constant throughout the full width of the cutter, states the manufacturer.

Result of design is shearing action that distributes the cutting load uniformly over full length of cutting edge. Under proper conditions of horsepower, speeds, and feeds, cutters reportedly give up to 4½ times more production between resharpenings and have produced finishes of 20 rms and better. Actual production of parts is stated to be increased as much as 10 to 15 times. Cutters are particularly useful in the machining of heat-treated alloy steels.

Slab mill is standard in 3- and 4-in. diameters and in widths of 2 to 4 in. for both steel and non-ferrous cutting. Clearance on end of teeth permits machining such surfaces as steps, shoulders, and webs.

Sonnet Tool & Mfg Co, 576 No Prairie Ave, Hawthorne, Calif



Lanco Six-Chaser Head For Large-Dia Threading

Six-chaser Lanco head was designed to meet requirements of precision threading of large diameter workpieces. It is a revolving die head for application to the No. 4 Model C Landmaco threading machine and features 2½ to 6-in. pipe capacity and 2⅞ to 6⅝-in. bolt capacity.

Unit is of massive construction with all parts made of alloy steel. All operating parts are heat-treated after machining and then ground. Six chasers provide 50% greater distribution of cut as compared to conventional four-chaser tangential die heads. Six-chaser design also features greater support for workpiece.

Unit can be equipped with internal trip mechanism, a reamer, and a reamer attachment for simultaneous threading, reaming, and chamfering of pipe and nipples. Reamer acts as a stop bar for the internal trip mechanism which provides constant thread length regardless of differences in pipe or nipple length or gripping position.

Landis Machine Co, Waynesboro, Pa

Dumore Heavy-Duty Handgrinder Does Milling and Grinding

Series 35 handgrinder uses ¼-hp motor to deliver speeds to 35,000 rpm. It is available for 115 or 230 volts, dc or ac, with ⅛ or ¼-in. collet chuck.

It can be used with tungsten carbide mills, highspeed cutters, mounted wheels and points, and abrasive bands for grinding, milling, finishing, and polishing materials ranging from wood to hard alloy steel. Overall length, including chuck, is 10¾ in. Body dia is 2 7/16 in. while small dia is 1 5/16 in. Weight is slightly over 3 lb.

Three micro-precision bearings are seated in steel inserts cast into grinder housing.

The Dumore Co, 1300 Seventeenth St, Racine, Wis

Morse Cam Clutch Units For Variety of Machine Drives

Cam-type, one-way clutch units are designed to serve as backstop, indexing and overrunning clutches in wide variety of machine drives. Known as 200 Series, units are made with OD dimensions and tolerances corresponding to seven sizes of standard 200 Series ball bearings. Clutches have no inner race—full complement of cams bear directly on hardened shaft surface.

When applied as backstop, outer race of clutch is keyed in housing bore; shaft on which cams bear can rotate in one direction only. As indexing units, the cam clutches act as self-contained ratchets with infinite number of teeth that are reported to be more accurate than conventional ratchet and pawl mechanisms. A second cam clutch can be installed to act as backstop device. These cam clutches are unit assemblies consisting of a hardened steel outer race, hardened ball bearing steel full complement cams, two steel energizing springs, two spring steel thrust washers, and two soft steel retaining plates.

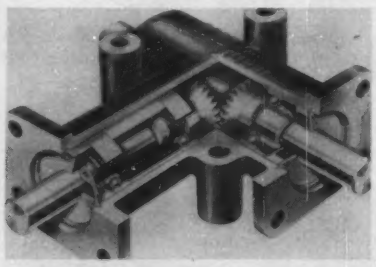
Outside diameters of shaft at the clutch bearing area are from 0.650 to 2.209 in.; lengths vary from 1 to 1¼ in. Free wheeling of shafts at speeds up to 2000 rpm can be achieved without excessive temperature rise.

Morse Chain Co, 7601 Central Ave, Detroit 10, Mich

Cadmium-Plated Caster

PressCoin Series 30 caster is so constructed that the top plate and upper raceways are of separate detail. This feature, plus heavy king pin helps retain the ball bearings in races under extremely rough usage. Features include: fully heat-treated; cadmium-plated; ⅝-in. king pin; larger ball bearings; fully coined raceways; and coined and formed one-piece yoke.

Midwest Precision Corp, Jackson, Mich



Right-Angle Gear Units Use Coniflex Bevel Gears

Coniflex bevel gears have been substituted for straight tooth gears to get quieter, cooler operation in ANGLgears, the standardized right-angle gear drives. Unit comes in two standardized models—1/3 hp and 1 hp. They are ball-bearing sealed units lubricated for life. Flanged end mountings and three-bolt side-mounting allow the units to be installed in any position.

Rated speed is 1800 rpm and both models are available in either 2-way or 3-way styles. The 1-hp unit lists at $39.75; the 1/3-hp at $19.50.

Airborne Accessories Corp, Hillside, NJ

Carbide Tool Grinder In Two Styles

Standard electrical 6-in. heavy-duty carbide tool grinder is available in either bench model or with floor pedestal. The ¾-hp, 3600-rpm motor is adapted for either single-phase or three-phase current. Equipment includes forward-off-reverse control switch and steel wheel guards which are adjustable for wear.

Heavy worktables on each side, measuring 10x7 in., are adjustable 10° above to 20° below horizontal axis. Machine is suitable for either grinding wheels or diamond wheels.

Standard Electrical Tool Co, 2480 River Road, Cincinnati 4, Ohio

Ampco Chain Hoist Is Non-Magnetic

One-ton chain hoist is non-magnetic, spark-resistant, for use in location where hoists of ferrous materials have proved unsuitable. It is of spur gear, ball bearing type and, for the most part, unit is constructed with Ampco special copper-base alloys.

All hoist chain is proof-tested at 4000 lb; hoists are recommended for use in hazardous areas.

Ampco Metal, 1745 S 38th St, Milwaukee 46, Wis

Ampco-Weld flux, a powdered product for use in welding of Ampco 8 and other aluminum bronze sheet and plate, may be used with the inert-gas processes and bare Ampco-Trode filler rods in all grades. Designed for mixing with an alcohol, and painted on all surfaces of the joint to be welded. Can be used successfully in joining of other copper-alloys, such as silicon bronzes, tin bronzes, and brasses.

Ampco Metal, 1745 S 38th St, Milwaukee 46, Wis

CORRECTION:

In the description of the heavy-duty Plano milling machine (*AM*—April 12 '54, p 240), it was stated that sizes of motors on milling head could be as large as 7 hp each. This should, of course, be 70 hp max per head.

Imported by Permasco, Div Winter, Wolff & Co, Inc, 76 Beaver St, New York 5, NY

Unless your operators work for nothing...

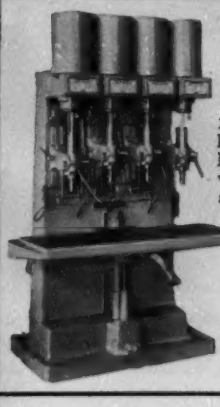
The savings in time alone will pay for New

LELAND-GIFFORD DRILLING MACHINES

Convenient central controls, stepped-up speed, reduced work handling, built-in safeguards against costly errors, fast speed changes, quick adaptability to different jobs are some of the time-saving features of the new Leland-Gifford Drilling Machines which make it possible for the average operator to greatly increase machine production. And with the added advantage of higher precision, he can produce *better* work at the same time.

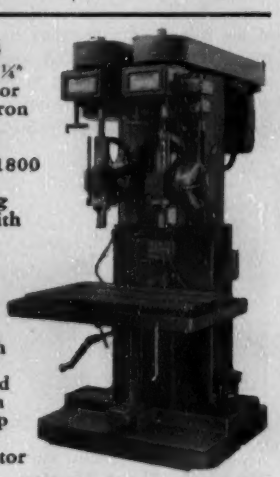
Leland-Gifford offers a complete line of motor spindle drilling machines — plus unsurpassed engineering skill and facilities for designing special tooling and adapting standard machines to meet any production drilling need. A Leland-Gifford field engineer can show you how to improve production and lower drilling costs with Leland-Gifford methods. Call the office near you.

No. 1LMS
Smallest holes up to 5/16"
Bench or floor types
One to Six Spindles
Speeds up to 10,800 RPM
12 or 20 inch Swing
Hand or Hydraulic Feed
Tapping by Friction
Tapping Attachment



No. 2LMS
Holes from 1/16" to 3/4"
One to Six Spindles
Speeds up to 3600 RPM
20 or 26 inch Swing
Hand Feed;
Power Feed with three feed rates and Positive, Adjustable Depth Stop; or Hydraulic Feed — either plain or step-by-step.
Tapping by Reversing Motor or Friction Tapping Attachment

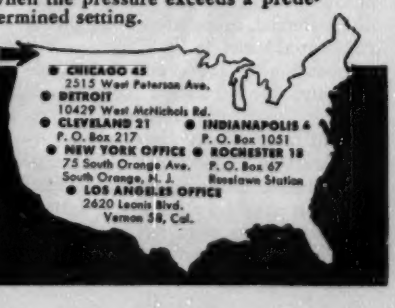
No. 3MVB
Holes up to 1¼" in Mild Steel or 1½" in Cast Iron
One to Four Spindles
Speeds up to 1800 RPM
24 inch Swing
Power feed with three Rates, Adjustable Depth Stop and Safety Slip Clutch.
Also can be furnished with Hand Feed or Hydraulic Feed — either plain or step-by-step
Tapping by Reversing Motor



HYDRAULIC FEED

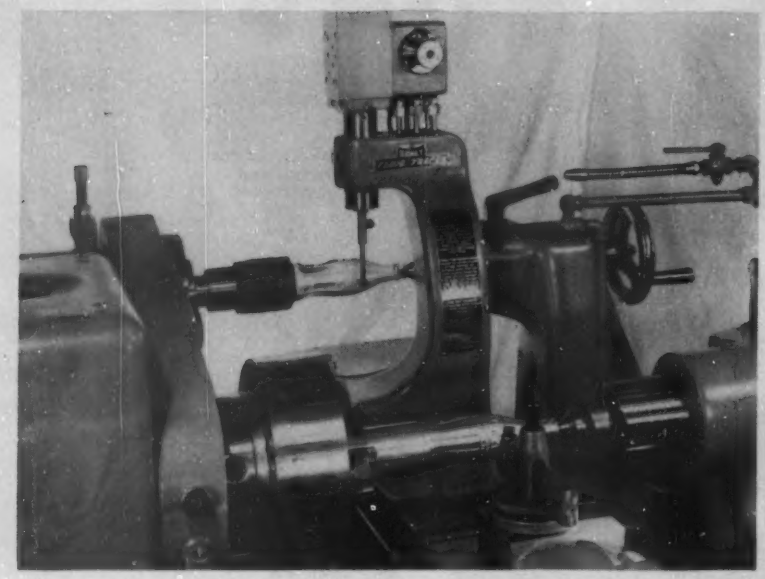
Two types of hydraulic feed are available — the well-known step-by-step type for deep hole drilling; and a plain feed for shorter holes or reaming. With either type the feed rate is *infinitely adjustable* and *independent*, and the maximum thrust pressure may be regulated with an overload release which withdraws the drill when the pressure exceeds a predetermined setting.

SAVE DAYS — CONTACT THE OFFICE NEAREST YOU



LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

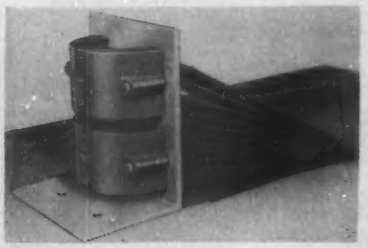


ROTATING TEMPLET DRIVE has been incorporated in Sidney fluid tracer lathe for use in work where radial contours as well as axial contours are required. This additional feature, as shown above, is incorporated on the 16-in. model 32 lathe. Templet drive consists of 1:1 ratio between work and templet. As the stylus follows the templet contour longitudinally, it will also, with the rotating templet drive, reproduce whatever radial contour is incorporated in the master. Addition of the rotating templet drive does not prohibit the use of the standard tracer control nor convenience in converting tracer control lathe to standard lathe operations — — *The Sidney Machine Tool Co, Sidney, Ohio*

Self-Aligning Pillow Blocks

Previously made by machining cast-iron hollow ball, the ball assembly of Randall's self-aligning pillow bocks is now made by forming steel to spherical shape. New process reportedly reduces cost of manufacturing, makes self-alignment easier due to smoother metal surface, and features larger oil reservoir. Assembly is available with either graphited-bronze bushings or with sintered-bronze bushings in sizes from ½ to 1 in. Assemblies may be purchased for inclusion on original equipment or other in-built bearing applications.

Randall Graphite Bearings, Inc, 1000 South Greenlawn Ave, Lima, Ohio



Free-spinning locknut rides over corrosion products on threads; said to stop galling and seizure common to high-temp operation. 1700 G series for temperatures to 1200 F; 1700 F series, to 1600 F. Sizes from 10-32 NF-3 through ⅜-24 NF-3. Meet specifications MIL-S-5059 and AN-S-126.

Nutt-Shel Co, Inc, 811 Airway, Glendale, Calif

Magnetic Sheet Floater Handles Odd-Shaped Stacks

Sheet floaters make it easy to handle irregular or odd-shaped stacks of steel sheets. They reportedly eliminate danger to operator due to sharp edges and speed up handling time as sheets are automatically floated one after the other. They also prevent double feeding and are said to handle oily, polished, or painted steel sheets with equal ease.

Sheet floaters are available in three sizes and handle sheets from 14-mil stock to ¼-in. plate. Alnico V permanent magnets are fastened in vertical position to L-shaped cast aluminum frame. L-frame is constructed so that it may be clamped or bolted into position as required.

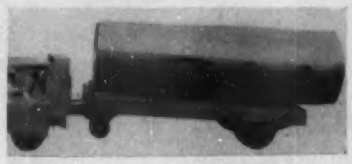
Homer Mfg Co, Inc, Dept 131, Lima, Ohio

V-belt reinforced with synthetic fiber is said to give 40% more hp capacity than standard belts. R/M Super-Power V-belt is also said to have longer life, and permit use of narrower sheaves, because fewer sheaves are needed for same power transmission. Belt is of all-synthetic rubber, oilproof, non-spark, and heat-resistant. According to manufacturer, belt has almost no stretch, avoiding belt-matching problems.

Manhattan Rubber Div, Raybestos-Manhattan, Inc, Passaic, NJ

Teflon O-rings are being molded by a company specializing in that plastic. Requests for information should be sent to manufacturer, because not all sizes are available.

Plastics Div, Sparta Heat Treat Co, East Sparta, Ohio



Market Forge Tractor Lift Handles Floor Trucks

Tractor lift allows hand-propelled floor trucks or semi-skids to be handled by power. Many trucks of this type are provided with swivel casters not intended for fast hauling; however, they are usually provided with bottom sills which can be grasped by special coupling arrangement so that one end may be lifted off the floor. Tractor lift may be used to lift legs of semi-skid off floor instead of using hand skid jack.

Standard Load Mobile tractor has been designed to incorporate electric-hydraulic unit for lifting and lowering by pushbutton control. Same coupling unit will handle different heights and sizes of trucks, in many cases without any alteration.

Market Forge Co, Everett 49, Mass

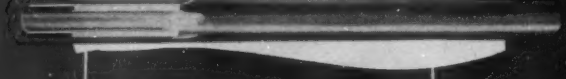
STANDARD CARBIDE TOOLS

by SUPER

CARBIDE END MILLS

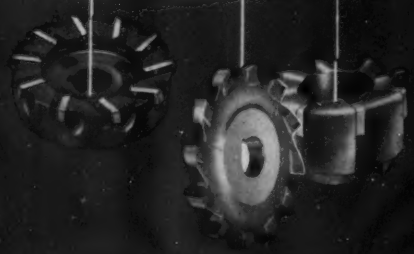
CARBIDE TWIST DRILLS

CARBIDE REAMERS



CARBIDE SPECIAL TOOLS

CARBIDE MILLING CUTTERS



CARBIDE TOOL BITS

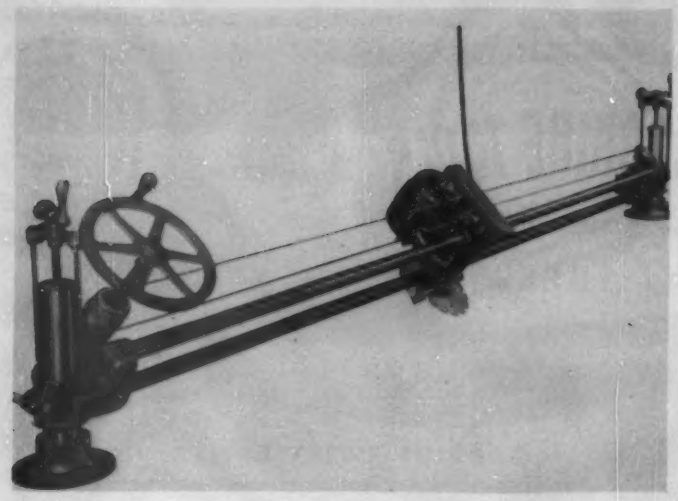
The Super line of carbide tools features aggressive and up-to-the-minute thinking in cutting tool design. More than 50 items in a complete range of sizes are carried in stock in warehouses conveniently located in New York, Detroit, Chicago and Los Angeles.

Super

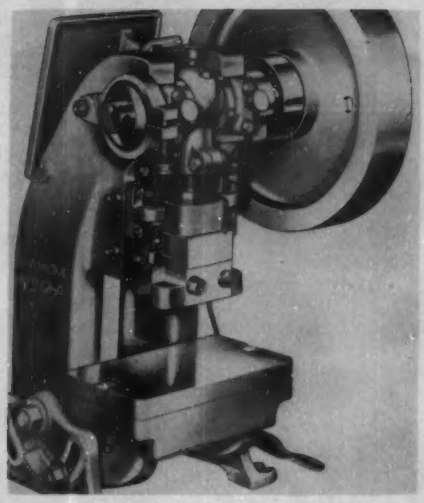
TOOL COMPANY

21650 Hoover Road, Detroit 13, Michigan

also 5210 San Fernando Rd., Glendale 3, California



LONG-RAILED PANEL SAW cuts metal, plastic, and plywood up to 10 ft in length, producing bevel or miter cuts from 0 to 90°. Photo indicates handwheel drum and steel cable device which provides convenient and precise control. Cutting rates run to 75 fpm and carriage returns to starting position in 5 sec. Any variable-speed drive may be belted directly to drum shaft for repetitive production cutting. Machine is light enough to be semi-portable. Finish side of work is in full view of operator —*Hendrick Manufacturing Corp, Room 308, Marblehead, Mass*



BENCH PUNCH PRESS, 9-ton capacity, was designed to meet stricter safety codes. Shut-die height is 7 in.; intermittent capacity, 11 tons; ram area, 4¼ x 5 in.; bed area, 6½ x 12 in. Standard stroke is 1½ to 3 in. Made in plain open-belt with 150 sfpm and back-geared to 100 sfpm — *Diamond Machine Tool Co, 5111 Coffman-Pico Rd, Pico, California*

Guide Pin Bushing of Powdered-Steel Alloy

R-B powdered-steel alloy bushing is heat-treated and has sealed internal oil wells as an integral part. Bushings are shipped with oil wells completely filled and no external oiling is required throughout life. Structure of powdered metal automatically assures proper lubrication to friction surfaces.

Over-all characteristics are said to be comparable to finest bronze bushings and guide pin wear is reported much less than can be obtained with any other type of bushing. In addition, design reduces possibility of seizing and galling guide pins.

Allied Products Corp, Richard Bros Div, 1560 East Milwaukee Ave, Detroit 11, Mich

General Radio Variac Motor Speed Controls

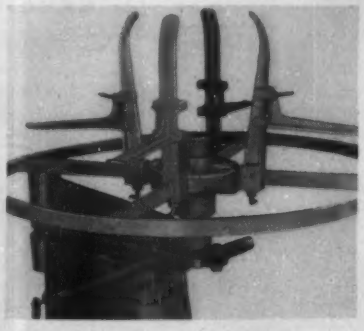
Power ratings for speed controls now extends from 1/15 to 1½ hp. Five models are available including type 1702-M with remote-station push-button and speed control. These models use the same basic system of control as earlier units and make possible the complete elimination of electron tubes or rotating machinery in operating dc motors from ac lines.

Separate selenium rectifiers supply field and armature power. A Variac - adjustable autotransformer ahead of the armature rectifier makes it possible to vary the armature voltage with good regulation. These controls can start motor slowly and smoothly. They find application on winding machines, lathes, and in precision grinding work and similar applications.

General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass

Specially processed phosphor bronze bare wire is especially applicable for overlay jobs, being a soft bearing alloy. Phos-Trode can also be used for joining brasses, tin bronzes, cast iron, and other metals. Available in 0.045, 1/16, 5/64, and 3/32-in. dia sizes, layer-wound on either spools or rims, in 25-lb packages.

Ampco Metal, Inc, 1745 S Thirty-Eighth St, Milwaukee, Wis



Nilson Clutch Reel Has Automatic Stop Control

Medium size wire and stock reel, designed with 4-in. oscillating movement, is reported specially useful in shops where one operator handles more than one machine. Oscillating feature reduces load on feed mechanism and automatically stops machine in case of wire entanglement.

A spiral spring holds back coil which is suspended and pivoted on vertical shaft. The 4-in. oscillating movement compensates for pulls on the stock thereby reducing load on feed. Overtravel of reel beyond 4 in. will automatically stop machine.

Clutch reel is furnished in two sizes: Model L with coil capacity of 175 lb and 8-in. minimum ID; Model M with 250-lb capacity and 12-in. minimum ID.

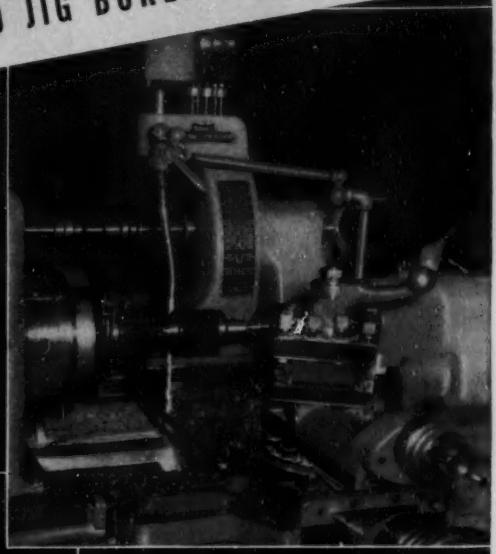
A H Nilson Machine Co, 1523 Railroad Ave, Bridgeport, Conn

SIDNEY

FLUID TRACER AT WORK

in the plant of

THE FOSDICK MACHINE TOOL CO.
CINCINNATI
MANUFACTURERS OF
RADIAL-SENSITIVE-UPRIGHT DRILLS
AND JIG BORERS



Here's what Fosdick thinks about Sidney Lathes:

"This Sidney Lathe with tracer attachment has been very satisfactory, resulting in considerably reduced production time and, at the same time, holding closer tolerances."

Note how simply and economically the SIDNEY FLUID TRACER reproduces any type of work in any quantities desired . . .

THE TRACER HEAD FOLLOWS ALONG A TEMPLATE OR MASTERPIECE AND THE WORK IS DONE WITH ACCURACY OF UTMOST FIDELITY . . . QUICKLY.

A survey reveals that 55 per cent of machines in most plants are 10 years old or older. More than 1,000,000 tools are in this obsolete class. Replace your obsolete turning-equipment with

MODERN SIDNEY LATHES

THE SIDNEY MACHINE TOOL COMPANY
50th Year
of service to
AMERICAN INDUSTRY
1906 - 1956
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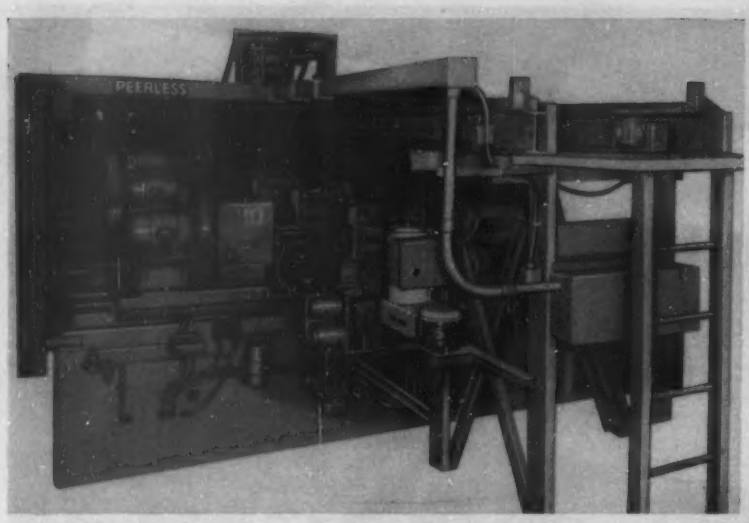


DIFFERENTIAL CARRIERS are processed on this transfer machine which accomplishes work formerly done by complete department. It takes raw cast carriers, roughs and finishes them, and then completes rough and finished boring and facing operations as well as drilling and tapping. The eight stations process 40 carriers per hour; hydraulically actuated transfer mechanism is utilized for pallet movement. Hydraulic feed unit is Peerless 17-in. way floor-type and bore face unit is hydraulically actuated and also made by Peerless. Another feature is the power-operated overhead pallet-return conveyor and elevators. Operational check is controlled by colored light pushbutton control panel — *Peerless Production Co, 19451 Glendale, Detroit 23, Mich*

Stock Die Blanks

Stock die blanks made of Ampco metal Grade 24 are recommended for use on press operations where stainless steel is being worked. It possesses low frictional qualities and is non-galling and non-loading. Blanks are available as solid rounds, rectangles, and centrifugally cast rings. Solid round sizes range from 1 to 5 in. in dia; rectangles range from ½ to 4-in. thickness with 1 to 4-in. widths. Lengths range from 6 to 12½ in. Rough-bored ID on centrifugally cast rings ranges from 1 to 12½ in., OD from 4 to 20 in., and thickness from 1½ to 3½ in. One face of cast rings is machined.

Ampco Metal, Inc, 1745 So 38th St, Milwaukee 46, Wis

Mechanical-Booster Vacuum Pump

Pump is for use as high-vacuum stage in low-pressure range where single vacuum pumps have poor volumetric efficiency. Designated Model MB, it is a rotary positive-displacement pump equipped with mechanical shaft seals. As a vacuum-booster pump, manufacturer states it is specially designed to exhaust into inlet of Kinney single-stage pump acting as second stage or backing pump. Combined unit is said to have far wider high-vacuum range with lower power consumption than has been realized up to now.

Model MB requires no sealing fluid; being free of volatile materials it acts as positive displacement compressor to retard undesirable backstreaming of oil vapors into the vacuum system.

First combination available is capable of producing a back-off pressure of 0.1 micron McLeod gage. At one-micron pressure, pumping speed is 750 cfm and in pressure range from 10 microns to 1-mm Hg pumping speed is about 1000 cfm. At high vacuum combined unit requires about 5 hp and at an inlet pressure of 15 mm Hg, about 15 hp.

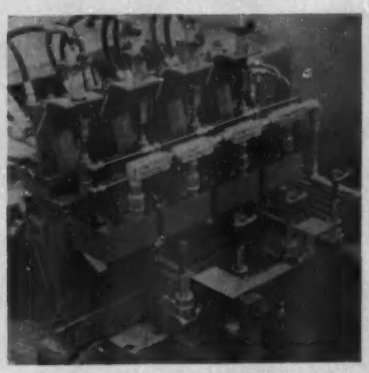
The Kinney Mfg Div, New York Air Brake Co, Boston, Mass

Stainless Steel Metal Powder

Stain Alloy can be used to fabricate gears, television cores, self-lubricated bearings, welding alloys, metallic paint, bushings, porous metal filters, small precision mechanical electronic and electrical parts, as well as conventional sintered parts. Powder is 18-8 low carbon moldable stainless.

Advantages include: increased resistance to intergranular corrosion; free-flowing, all particles pass through 150 mesh; substantially free from surface oxidation; moldable at compacting pressures of 30 to 50 tons per sq in.; and effective sintering obtained at 2100 F with normal sintering time.

Alloy Metal Powders, Inc, 238 Eagle St, Brooklyn 22, NY

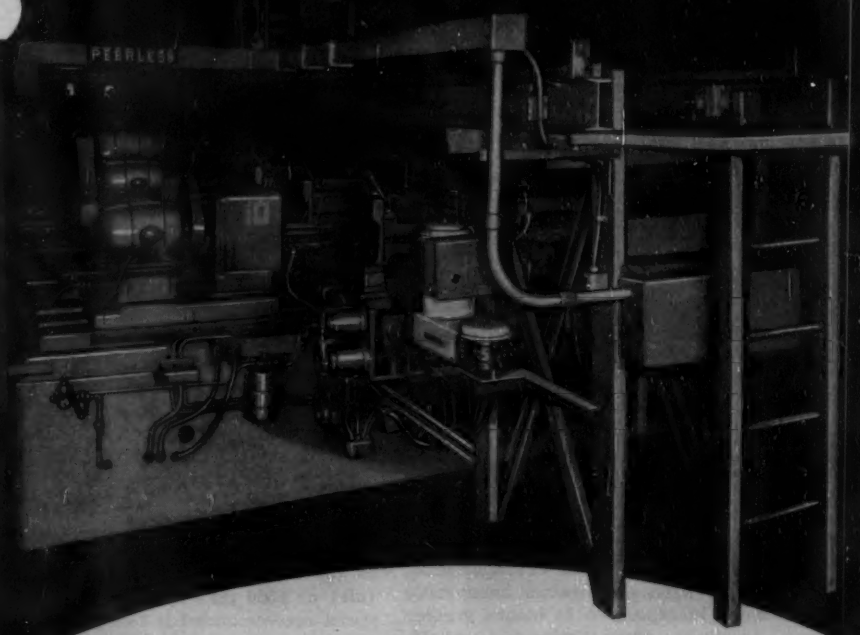


ROCKER ARMS are produced on this Model 221 Bore-Matic which is designed with four individual fixtures and loading mechanisms mounted on a fixture sub-base on the machine table to allow operator to load four stations during boring operations on previously loaded parts. Operator fixes parts on four-stake-type loading arms and swings arms up into fixture. As fixture clamp button is actuated, air hammer arrangement seats parts in fixture. Operator retracts loading stakes, contacting microswitch to start table. After boring tools are automatically retracted, table runs out at rapid traverse. Boring heads are running at 1750 rpm with boring lead of 0.004 in. Net production is 600 parts per hour—*Heald Machine Co, Worcester 6, Mass*

PEERLESS

ENGINEERING EXCELLENCE

that does the Never-Before, ***NOW***



like the precision work by this transfer machine which replaced an entire department

Before this PEERLESS, an entire department was employed to process various differential carriers.

Now, this PEERLESS takes these raw cast carriers . . . roughs and finishes them . . . and then completes rough-and-finished boring and facing operations, as well as drilling and tapping—

And still holding precision boring and facing tolerances!

Yet this PEERLESS retains the flexibility of an individual-operation setup!

See other examples of PEERLESS Engineering Excellence that does the *Never-Befors, NOW!*

Part and Production: Differential Carrier for heavy truck axle. 40 pieces per hour at 100% efficiency.

Type of Equipment: 8-Station Transfer Machine with 5 working, 1 load and unload, and 2 idle stations, utilizing a hydraulically-actuated transfer mechanism for pallet movement. Power-operated overhead pallet-return conveyor and elevators. Peerless 17"-way floor-type Hydraulic Feed Unit. Peerless hydraulically-actuated Bore Face Unit. Colored-light Operator Control Board.

Tooling: Single-place pallet fixtures with automatic positive positioning. Hydraulically-actuated boring and facing heads. Fixed-center ball-bearing drill heads and individual lead-screw tapping heads.

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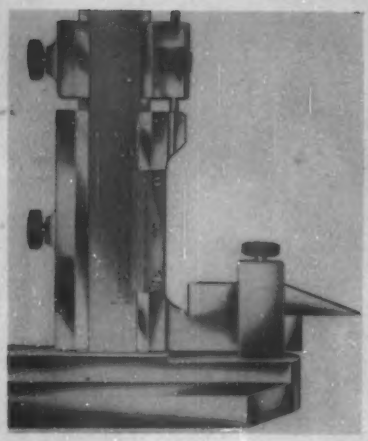


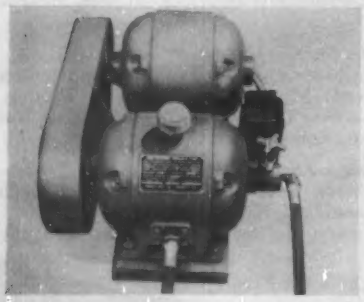
Chrome-Plated Height Gages

Foster height gage has a completely hardened beam and 1.225-in. adjustable vernier is also made of chrome-plated stainless steel. A longer slide, larger base, and heavier beam have been incorporated to insure greater accuracy. Sizes obtainable are 12, 14, 18, 24, 36 and 48 in.

Foster Supplies Co, 6122 Milwaukee Ave, Chicago 30, Ill

Master 5% beryllium alloy in iron is designed to answer demand for product to allow addition of beryllium to stainless steels. Is said to give both hardenability and corrosion-resistant and non-galling properties to stainless steels.

Beryllium Corp, Reading, Pa

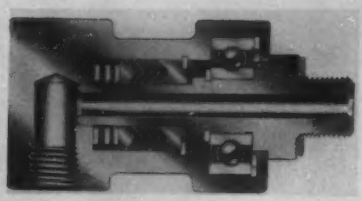


Electric-Hydraulic Pump Package

Manco Series H Hi-Thrust pump is capable of delivering 2.04 gpm at 8,800 psi in intermittent operation. Higher outputs can be obtained at lower pressures up to 4.5 gpm at 6200 psi.

Pump is six-piston wobble-plate type with operating speeds from 900 to 220 rpm displacing 57 cu-in. per rev. Weight of unit is 300 lb.

Manco Mfg Co, Bradley, Ill

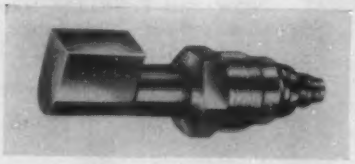


Revolving Joint Provides Air and Hydraulic Service

Revolving joint has ¼-in. ID for making air or hydraulic piping connections to such items as clutches, power - transmission drive units, chucks, spindles, and grinding wheels. Joint, designated Type NV features: compact one-piece bronze casing; special spring-loaded V-ring seals; hardened and ground steel shafts; permanently lubricated sealed ball bearings.

Overall length of joint is 3⅝ in.; it is suitable for use at temperatures to 180 F and pressures to 300 psi (air) or 1500 psi (hydraulic). Max speed recommended is 2500 rpm for normal applications.

Barco Mfg Co, Dept J-15, 500 Hough St, Barrington, Ill



Cutting Tip

Cutting tip permits faster machine-cutting of bevels on steel plate of ½ to 2-in. thickness. The NCG tip has an added set of orifices positioned to permit six additional preheat flames to impinge directly on line of cut. Tips are made in three sizes for use with oxygen and acetylene and attached to company's Torch-weld No. 70 and 71.

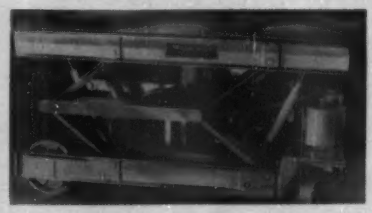
National Cylinder Gas Co, 840 N Michigan Ave, Chicago 11, Ill

Automatic Loaders for Stamping, Forging Presses

Loaders permit production increases of up to 300%, according to manufacturer. Main feature is 120° index table with offset-flanged drive motor and index mechanism which permits mounting of die punch at optimum dead-center ram position. This design avoids multiplicity of duplicate punches on periphery of index table and concurrent cycle time limitations. Because only one punch is in die area, max operator safety is provided as well as clearance between die block and outer punches.

The loaders have a high-speed standard Hautau-Turndex, shock-free, constant-accuracy modified cycloidal cam and shot pin index mechanism. Production rates of presses equipped with Hautau automatic loaders are limited only by speed of press.

Hautau Engineering Co, 721 Wanda, Ferndale 20, Mich

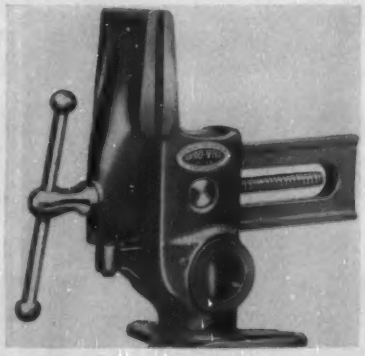


Hydraulic Lift Table

To handle heavy dies, machined parts, or sheet steel, West Bend has developed a new hydraulic lift table accommodating loads to 5 tons, raising them 42 in. Unit raises load straight up from 26 in. above floor.

Ball-bearing wheels and casters give table mobility for manual or shop-tractor transport. Table surface is ¼-in. steel plate; lifting mechanism consists of four cylinders fed from central hydraulic unit operated electrically or by foot pump.

West Bend Equipment Corp, Water St, West Bend, Wis



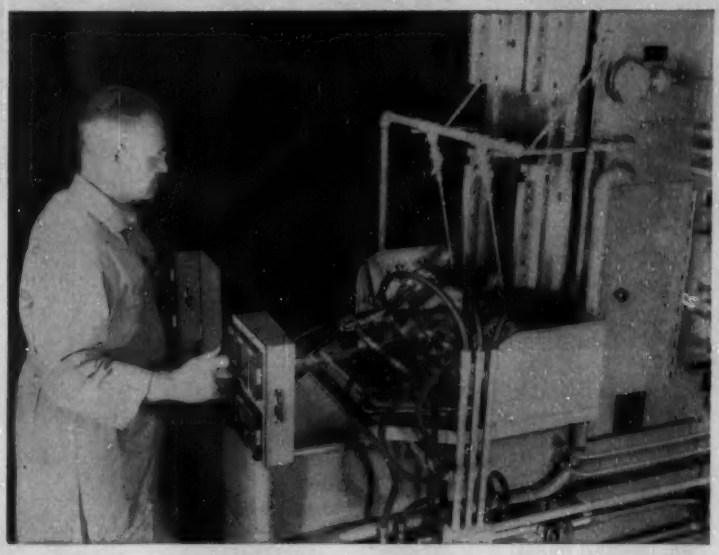
All-Purpose Vise Works in Any Position

Columbian Gyro-Vise 72½ operates from and rotates around a standard base which can be mounted in any desired position. Regardless of position, vise moves in a full circle and locks automatically.

Jaws are 2½ in. wide and 4¼ in. deep and max opening is 5 in. Overall height is 10½ in.

The Columbian Vise & Mfg Co, 9021 Bessemer St, Cleveland 4, Ohio

ANOTHER *American* FIRST



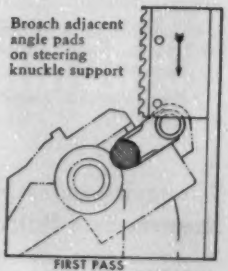
FIXTURE TILTS AUTOMATICALLY TO BROACH TWO PADS 70° APART IN ONE PASS

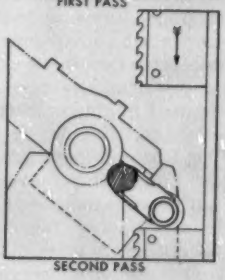
standard American machine and broaches, special American fixture solve problem

Two angle pads located 70° apart on a steel steering knuckle support are broached in one pass on a standard American vertical single ram surface broaching machine. A two station fixture on a receding work table is provided to allow for automatic tilting. Two broaches are mounted in vertical line for each station with a gap of about 12″ between them. This gap allows clearance for the part to be tilted into position for broaching the second pad.

The operator loads two parts. The parts are then automatically clamped and the receding table moves into broaching position. The first pad is broached — then between the gap, the fixture automatically indexes tilting the part so that the second pad can be broached. The table automatically moves back, parts tilt up and automatically unclamp, and the operator is ready to begin the cycle again.

American engineers are equally adept at designing machines, broaches and fixtures to solve your metal removal problems. Send a part print or a sample with your hourly requirements for a suggested solution. There is no obligation on your part.





American Circular 300 which lists all the standard American Vertical Hydraulic Surface Broaching Machines is yours for the asking. Write for it today.

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

Electric Fork Truck For Close Operations

Low-clearance, narrow-width electric fork truck, termed Safety Silhouette, was designed for particular requirements of over-road vehicle loading. Mast height is 68 in.; operator's head is protected. Driver's seat is accessible from either side.

Lift, tilt, and attachment controls are centralized and mounted behind the steering column. Truck is equipped with Yale's dead-man control which automatically applies brake and shuts off power when operator leaves seat.

Built on 50-in. wheelbase, truck is equipped with 36-in. forks, pivots around 90° corner in 61-in. aisle, and makes right-angle turn in 119-in. aisle. Forks are adjustable from 10 to 31½ in.; loads can be stacked 100 in. above floor level.

Yale Materials Handling Div, Yale & Towne Mfg Co, Philadelphia, Pa

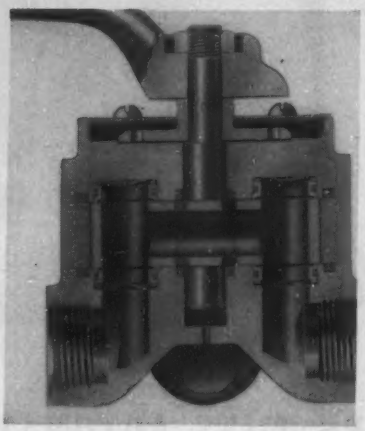
Telescoping Sleeves of Neoprene-Base Material

Minimum close-down length of telescoping sleeves is obtained through controlled convolution diameters. If necessary two, three, or more weights of the neoprene base material may be used to obtain specified operating characteristics. For high-speed flexing, 0.033-in. materials are used. For machinery that moves more slowly but imposes more severe duty, 0.050-in. materials are fabricated into overall design. A solid may be included in the design to serve as a cushion block.

Through use of specially developed machines and improved production processes, no molds are required in the production of the most complicated designs. Additional field requirements have influenced manufacturer in its development of various coatings and application of watertight zippers. One coating may be applied as an aid to vulcanizing the seams while another may add an element of flame-resistance to over-all closure.

Additional information is contained in manufacturer's bulletin AH-2.

A&A Mfg Co, 2017 West Clybourn St, Milwaukee 3, Wis



Selector Valve

Balanced selector valve handles pressures up to 6000 psi. It consists of body, ported as desired, which encases disk having internal flow passages. As disk is revolved to produce flow through ports, sealing rings take effect and eliminate cross leakage within valve. As an example of ease of turning it is reported that 6-in. handle is adequate for turning disk of 1-in. size under 6000-psi pressure.

Pump is made in sizes ⅜ to 1 in. for 0 to 2000 psi and ⅛ to 1 in. for 0 to 6000 psi for most services; 0 to 1000 psi for air; and 0 to 3000 psi for gas service. Three types of portings are available—side or bottom pipe-tap and sub-plate mounting.

Republic Mfg Co, 1930 W 77th St, Cleveland 2, Ohio

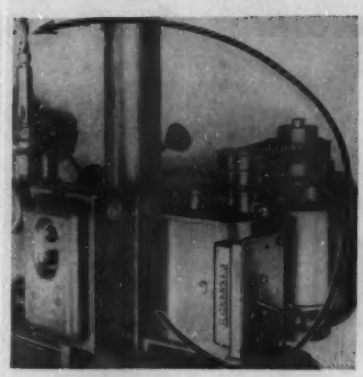
Air Tumbler

Dust Suppression and Engineering Co has developed a wet-type dust collector, known as Air Tumbler, characterized by simple design which dispenses with usual water curtain and sprays, water eliminators, pumps, and rotary elements.

It is claimed that because of its simplicity, maintenance is reduced to a minimum without sacrificing collecting efficiency.

Additional information may be obtained from manufacturer's bulletin.

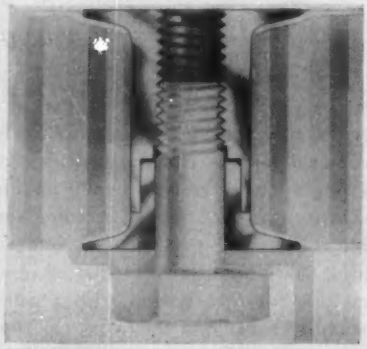
Dust Suppression & Engineering Co, PO Box 67, Lake Orion, Michigan



4-Speed Transmission Uses Timing Belts

One-hp capacity, 4-speed transmission uses Gilmer timing belts and pulleys, requires no lubrication, and can be used in vertical, angular, or horizontal position. The four-speed changes are instantly available through a shift-lever handle. Unit can be used as reducer or step-up drive and is suitable for operating on small drillpresses, lathes, milling machines and grinder headstocks.

Western Mfg Co, 3400 Scotten Ave, Detroit 10, Mich



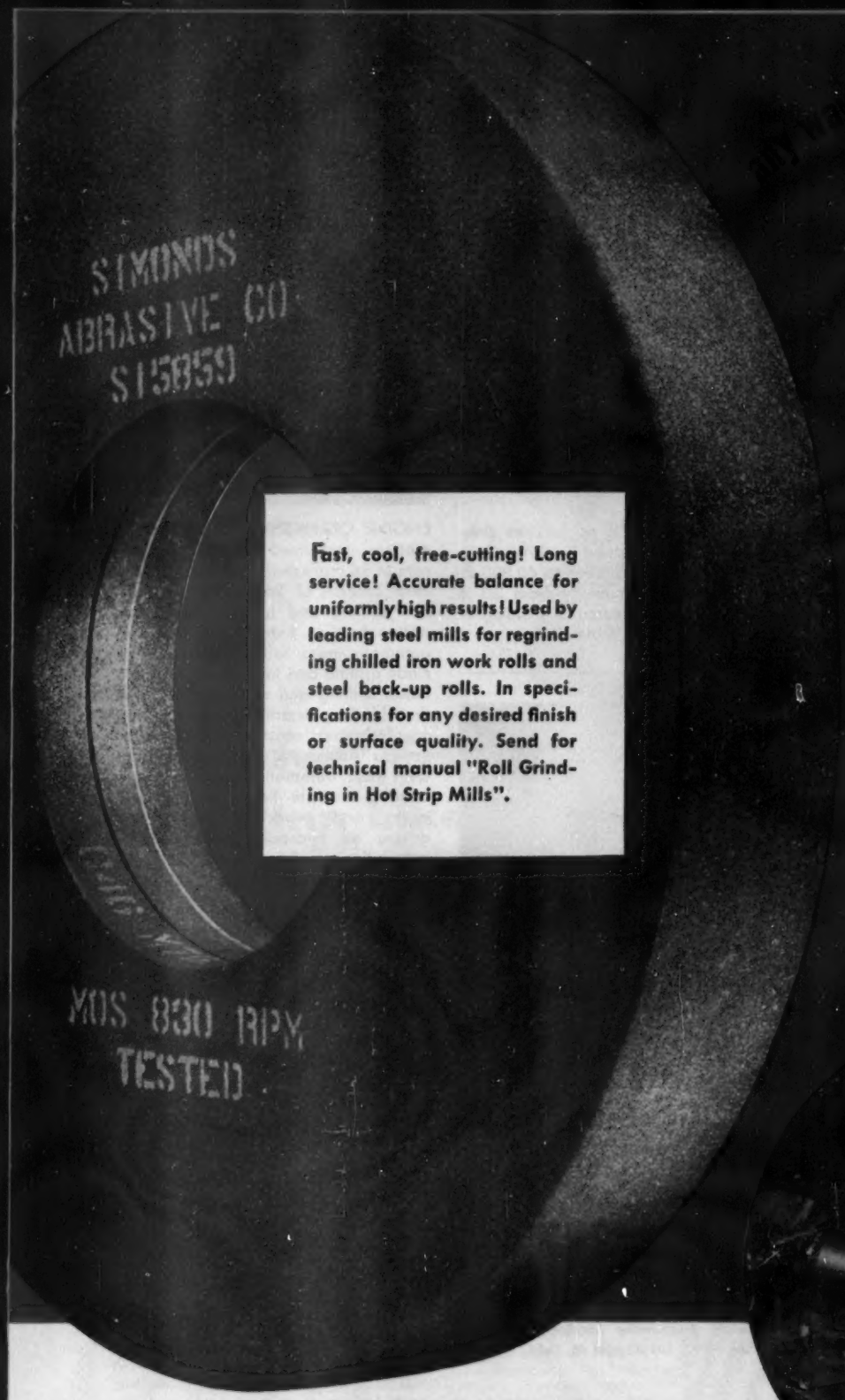
Threaded Spacer for Fragile Structure

Fasco threaded spacer, for sandwich-type structure fastening, has a tapped sleeve which received attaching bolt and eliminates need for a nut. It was developed for light-load applications where strength of through bolt using regular Fasco is not required.

Spacer provides means of attaching cables, instruments, and other equipment without danger of crushing panels. Other applications include soft woods and places where fastening take-up must be limited.

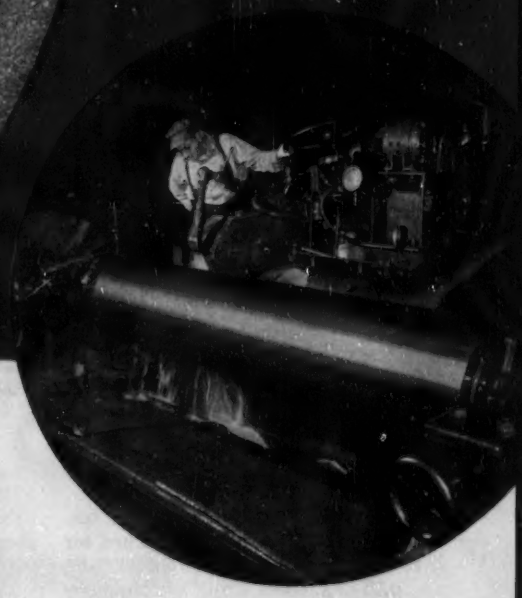
Material is 24 ST-3 aluminum alloy, anodized. Grip lengths are from ⅜ to 1¼ in.

The Delron Co, Inc, Fasco Div, 5224 Southern Ave, South Gate, Calif



SIMONDS GRINDING WHEELS are the right start for the finish you want in ROLL GRINDING

Fast, cool, free-cutting! Long service! Accurate balance for uniformly high results! Used by leading steel mills for regrinding chilled iron work rolls and steel back-up rolls. In specifications for any desired finish or surface quality. Send for technical manual "Roll Grinding in Hot Strip Mills".

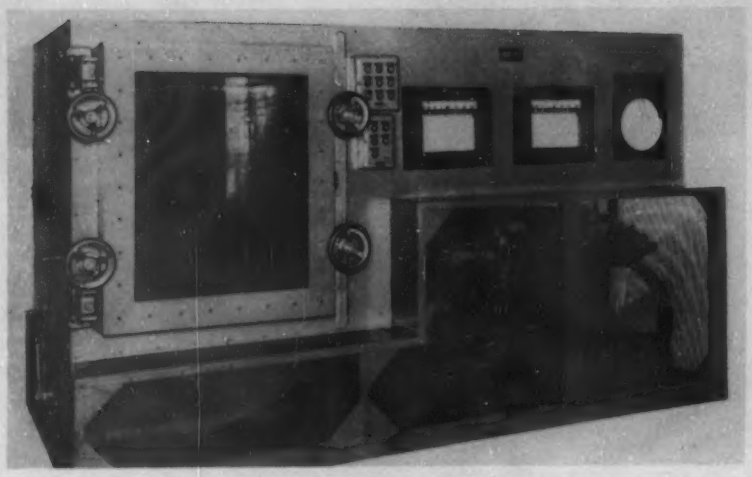


SIMONDS ABRASIVE CO.

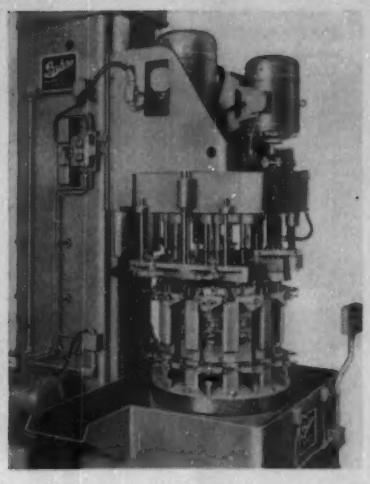
PHILADELPHIA 37, PA.

BRANCH WAREHOUSES: BOSTON, DETROIT, CHICAGO, PORTLAND, SAN FRANCISCO • DISTRIBUTORS IN PRINCIPAL CITIES

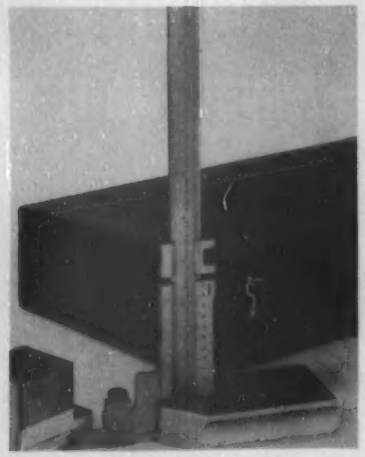
DIVISION OF SIMONDS SAW AND STEEL CO., FITCHBURG, MASS. • OTHER SIMONDS COMPANIES: SIMONDS STEEL MILLS, LOCKPORT, N.Y., SIMONDS CANADA SAW CO., LTD., MONTREAL, QUEBEC AND SIMONDS CANADA ABRASIVE CO., LTD., ARVIDA, QUEBEC



ENVIRONMENTAL SIMULATION chamber provides up to 7½ psi positive pressure in addition to automatically controlled temperature-altitude humidity. Temperatures from — 100 to + 185 F can be maintained at altitudes to 60,000 ft. Other features include automatically controlled relative humidity from 20 to 100%, automatic control of pressure and altitudes and automatic draining of all humidity devices below freezing — *American Research Corp, Bristol, Conn*



ENGINE CRANKSHAFTS have 26 operations performed on them at the rate of 96 crankshafts per hour. Equipment consists of 26-spindle combination drilling and tapping head, 10-station holding fixture, and precision automatic index table. Operations include drilling and tapping six 7/16x20 holes, drilling and reaming one 7/16 dowel hole, plus drilling, reaming, and counterboring center hole. Features include hardened and ground tool steel ways, automatic lubrication, ball-bearing multiple heads with shaved gears and broached-and-splined drives; all hydraulic and electrical installations conform to JIC standards —*Bahr Machine Tool Co, Ann Arbor, Mich*



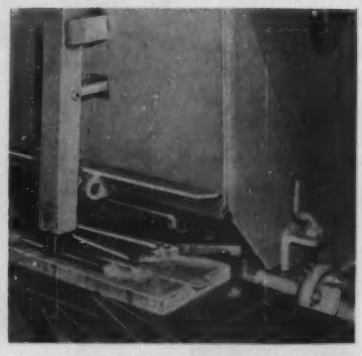
Scherr Height Gage Features Improved Scribing

Improvement on Scherr tool consists in base slotted in front to allow short solid jaw with straight scribing point to reach down to surface plate used. Marking and reading can start from bottom with vernier scale set to zero.

A vernier 2.450 in. long divided into 50 lines extends over 49 graduations of 0.050 each on the main scale to enable reading 0.001 in. with the naked eye. Open slide permits view of the entire scale.

Stock sizes are 10, 20, and 40-in. measuring capacity. Universal test indicator can be readily attached for reading in "tenths" or to 0.0005 in.

George Scherr Co, Inc, 200 Lafayette St, New York 12, NY



FLANGE-ROLLING MACHINE DEVELOPED by Douglas Aircraft has capacity for rolling 0.12-in.-thick aluminum and adjustments provide for rolling a C flange ¼ to 2 in. long and ½ to 3½ in. deep. Machine is mounted on steel stand with vertically adjustable table in front. No special dies are required. Adjustments are made with handwheels within easy reach. Flange to be formed is clamped between adjustable backing plate and adjustable clamping foot. Clamping is done through one air cylinder and rolling by another with both pressures equal— *Calstate Engineering Service, 8517 Santa Monica Blvd, Los Angeles 46, Calif*

Cobalt-base spring alloy, Elgiloy, has been placed back on the market. Product was withdrawn in 1950 when shortages of cobalt and nickel led to restrictions on their use.

Abrasives Div, Elgin National Watch Co, Elgin, Ill

Mastic Nut Lock

Mastic nut lock is reported to provide tighter nuts, studs, and screws and eliminate lockwashers and special locknuts. Designated Zorlok, it is applied by spatula, by dipping, or by squeezing direct from a tube. When nut is started, Zorlok is forced up and into threads. It dries in 72 hr at room temperature.

Mastic nut lock has 60-75% more back-off resistance than conventional type lock washers according to the manufacturer. It is non-corrosive, non-oxidizing and prevents thread rust. Zorlok can also be used as a complete seal on blind screws, cap screws, Allen screws.

Presstite Engineering Co, 3798 Chouteau Ave, St Louis 10, Mo

Portable seven-drawer toolbox with top compartment for large tools, has cork linings to protect tools and absorb moisture. Smooth finish is easily wiped clean, and a key will lock all drawers, leaving the top compartment open, if desired. Over-all dimensions are 19½ x 8¼ x 5½. in.

Huot Manufacturing Co, 530 N Wheeler St, St Paul 4, Minn

You never "Get Stuck" with Pins Like These!

In the finest costume jewelry . . . pins, brooches, clips, buckles and links . . . you will find the base of much of it to be good *solid* Bristol Brass.

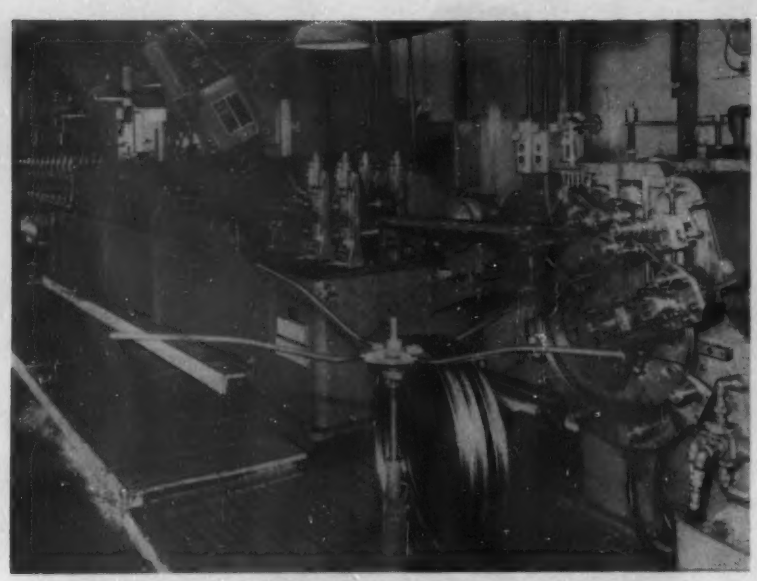
For manufacturers of these high-style lines know that they can always depend on rich low Brass from the Bristol mills for clean surface, always free from pits, and for color that is always uniform. They know that Bristol Brass gets to their plants right on time and ready for processing.

And *you* . . . no matter what type of Brass strip, coil, rod, or wire you need for any type of product . . . will likewise find that Bristol supplies it right on schedule, and right according to specifications, shipment after shipment. "*Large statement?*" Test it for yourself. Write, wire, or phone Bristol 9246.

THE BRISTOL BRASS CORPORATION

has been making Brass strip, rod and wire here in Bristol, Connecticut since 1850, and has offices and warehouses in Boston, Chicago, Cleveland, Detroit, Milwaukee, New York, Philadelphia, Providence, Rochester. The Bristol Brass Corporation of California, 1217 East 6th St., Los Angeles 21. The Bristol Brass Corp. of Ohio, 1607 Broadway, Dayton.

"Bristol-Fashion" means Brass at its Best

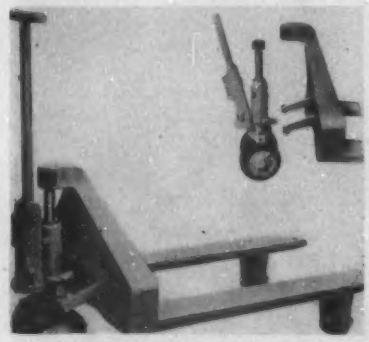


BICYCLE RIMS are seam-welded on these three welders built into 40-ft production line for Canada Cycle & Motor Co. Flat strip, 0.028-in. thick, is fed at rate of 35 fpm, formed to shape with edges folded together, and resistance seam-welded. Line turns out 5 to 6 rims per min. The welders, with vertical and special tilted frames, are equipped with anti-friction bearing-mounted shafts and current collectors to carry continuous current at high welding speed—*The Taylor-Winfield Corp, Warren, Ohio*

PRECISIONAIRE application checks true center distance between crankshaft and piston-pin bore of a connecting rod within ± 0.0005 in., also piston-pin-bore diameter and centrality of crankpin and piston-pin bores with their side bosses. Operator has only to load and unload gage and observe float patterns — *The Sheffield Corp, Dayton 1, Ohio*

Demountable snap-in clevis pins available in many types and sizes up to those used on 25-ton stabilizing jacks. Require only one hand for application or removal; when locking telescoping tubing, latch is inside tubing, avoiding weather exposure.

Marvel Industries, Inc, Sturgis, Mich



Pallet Truck Has Five-Inch Lift

Pallet truck was designed to perform with both light and heavy loads. Lift of 5 in. is accomplished with smooth-functioning, fast-acting hydraulic pump, and lowering is done at controlled speeds. Trucks are marketed in 2600 and 4000-lb capacities with fork widths of 20½ to 27 in. Fork lengths are available for various specific jobs; there are 20 models from which to choose.

Front wheels and fork wheels are each carried on two ball bearings. Overload is prevented by relief valve. Two main assemblies are dismantled by removing two bolts.

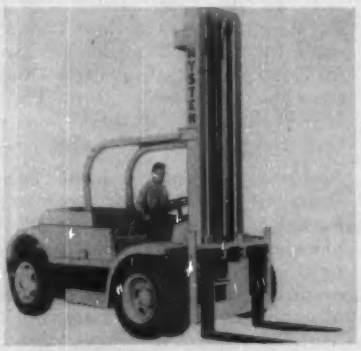
Paliton, Inc, 40 W 29 St, New York 1, NY

Diaphragm motor control valve is designed for wide-band proportional control instruments. "Series 800" has redesigned diaphragm motor with pressed steel case plates. Valve has yoke with mounting bosses on either side, for auxiliary equipment, and bolted or screwed stuffing boxes. Direct action, reverse action, and springless diaphragm motors, to operate either double- or single-seated, straight-through bodies, or Venturi 3-way and low-flow bodies. Also available is line of solid V-ported, double-seated plugs and added spring range of 6 to 30 psi.

Industrial Div, Minneapolis-Honeywell Regulator Co, Wayne and Wissahickon Aves, Philadelphia 44, Pa

Custom-molded silicone rubber products are being made for automotive, aircraft, electrical equipment, and other industries. Company states that complete services are available for compound formulation, mold-making, and acceptance of responsibility from blueprint to finished part. Rubber-to-metal bonds are reportedly being made on surfaces as smooth as 5 mu-in. using a newly-developed Permadizing process.

Stillman Rubber Co, 5811 Marilyn Ave, Culver City, Calif



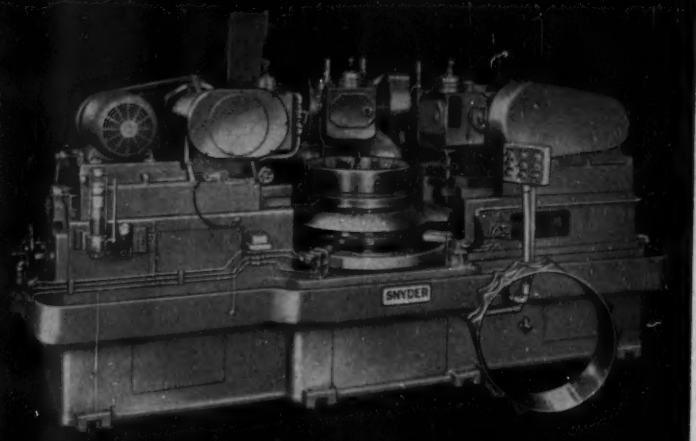
Hyster Lift Truck Has 15,000-lb Capacity

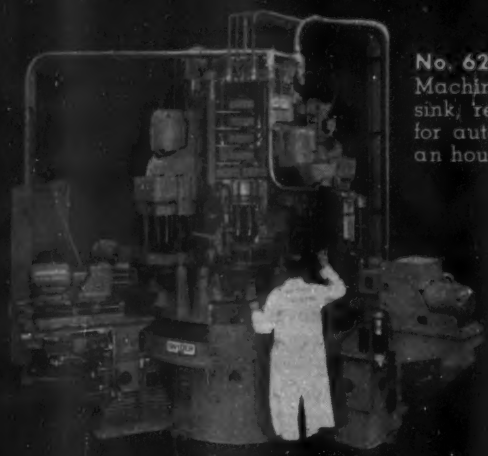
Model RC-150 is powered by heavy-duty water-cooled industrial engine and mounted on 8.25 x 20 pneumatic tires. It has a capacity of 15,000 lb at 24-in. load centers and is reported to have extremely short over-all length and narrow width.

Other features include: high degree of visibility, fully roller-mounted uprights, extreme braking area and strong body construction.

Hyster Co, Portland 8, Ore

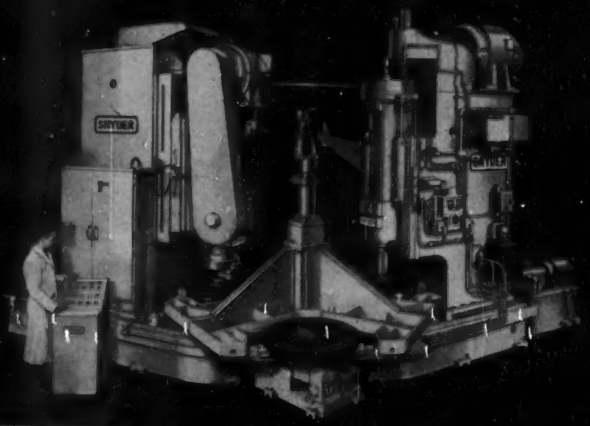
No. 68326—A three-way machine to profile mill four rows of lugs on a compressor casing for jet engines. 135 minutes are used to perform this operation in 3 steps.





No. 62207—Six Station Center Column Machine to drill, counterbore, countersink, ream and tap converter housing for automatic transmissions. 91 pieces an hour at 80% efficiency.

No. 67677—Two-Station, Vertical Column, Boring and Facing Machine to rough bore and face the hub of heavy railroad car wheels. Bore 6¾" x 7" long. 33 units an hour at 100% efficiency.



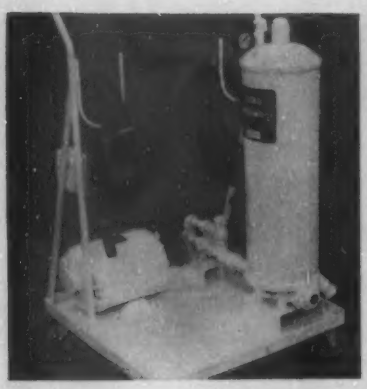
SPECIALS by

SNYDER

TOOL & ENGINEERING COMPANY

3400 E. Lafayette, Detroit 7, Michigan

29 Years of Successful Cooperation with Leading American Industries



Portable Filter Unit

Portable filter is completely equipped with pump, motor, oil-resistant hose, gages, and filter. It filters such fluids as lube and hydraulic oils, coolants, and wide range of heavy and thin industrial fluids.

Design pictured is equipped with ½-hp motor and gear pump with 4-gpm capacity; it guarantees removable of particles down to 25 microns.

Cuno Engineering Corp, Meriden, Conn

Automatic Control Of Rotary Speed

Mechanical-electrical translater is available in two models: the first will open or close any desired electric circuit at predetermined rpm; the other is a multispeed instrument which can be used for automatic control of a sequence. Unit is 2½ in. in dia and 4½ in. high, fitting standard Army-Navy mounting pad.

Features include ability to operate when mounted in any position and ease with which unit can be adjused to operate at desired rpm. Operational range is 1200 to 5000 rpm; accuracy ± 2%.

Kahn & Co, Inc, 541 Windsor St, Hartford 1, Conn

Inch-Gram Torque Wrench

Standard model torque wrench F80-I-G, 0 to 80 in.-gram range is reported to be the lowest capacity instrument of this type. The wrench may be handled as an ordinary small tool and is guaranteed to remain permanently accurate.

Widely spaced increment markings on the scale are in steps of 5 in.-grams and are easily read from any working position. Other models have ranges from 0 to 8 and 0 to 16 inch-ounces.

P. A. Sturtevant Co, Addison, Ill

Aluminum Wall Paint

Sherwin-Williams Opal-Glo is an opalescent finish available in seven colors. It is truly opaque, covers 800 to 1,000 sq ft per gal. By virtue of the metal's unique optical properties the paint is said to achieve unusual depths and tones of color, without metallic sheen.

Aluminum Co of America, 721 Alcoa Bldg, Pittsburgh 19, Pa

Dumore Hand Grinder Is Redesigned

Dumore Super-10 hand grinder is a newly designed version of the Dumore Series 10 hand grinder powered by a 0.1-hp. continuous-duty-rated 115-volt ac-dc motor. It features speeds to 22,000 rpm and swings vitrified wheels up to one inch in diameter. Its overall length is 10¼ in., body diameter 2 7/16 in., and small diameter 1 5/16 in.

The Dumore Co, 1300 Seventeenth St, Racine, Wis

Cold-Worked Bolts Have Double Life

Standard Pressed Steel cold-works military standard (MS) bolts in the fillet area under the head, and reports that fatigue life under standard tests has been raised from 30,000 to 65,000 cycles. The cycle is the tensing of the bolts from preload to a dynamic in-action load and relaxing back to preload.

Shown above are the largest and smallest of these double-life aircraft internal wrenching bolts used to hold together parts of the air frame. The cold working is done after the bolt is heat-treated. Five sizes ranging from 1 to 1½-in. dia have been added to the MS line.

Standard Pressed Steel Co, Jenkintown, Pa

Belt Conveyors

A series of power-driven, wire-mesh belt conveyors includes wide variety of widths and lengths. Examples of functions are washing, spraying, cooling, baking, drying, annealing, molding, ceramic firing and heat-treating.

Sage conveyors can be operated at constant or variable speeds to conform with production requirements.

Sage Equipment Co, 30 Essex St, Buffalo 13, NY

Metal-Cleaning Concentrate Removes Quenching Oils

Washing compound 103 is non-corrosive and designed for effective removal of oils, grease, lubricants, soils, lapping and drawing compounds. For both batch and spray-type washers, agent will produce metallurgically clean workpieces within 3 to 10 min. Compound is mild and will not harm skin or clothing.

Because it is concentrated, less than 1 oz of washing compound per gal of water provides efficient degreasing solution. Modified compound, designated 107, provides increased solubility and is available for unusual conditions.

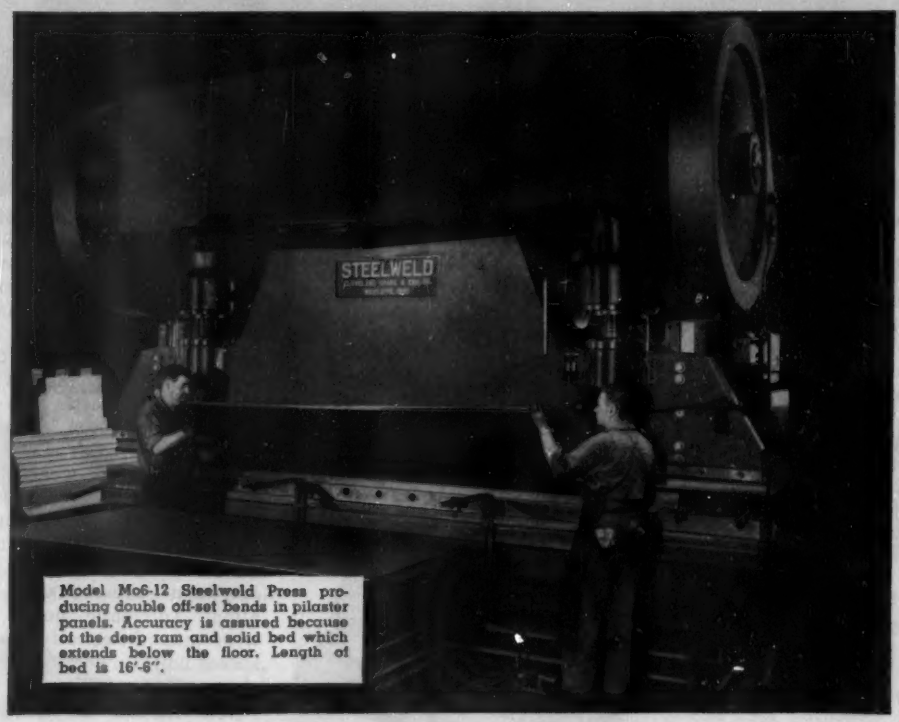
Ipsen Industries Inc, 715 S Main St, Rockford, Ill

Double-acting cylinders for air, water, or l-p hydraulic operation, available in 1⅛, 2 or 3-in. bore, any stroke, with either single- or double-ended piston rods. Said to be first such equipment with Thomson Nylined bearings, and "Copper-brited" honed cylinder tubes for corrosion resistance. Adjustable cushions available on front or back of 2 and 3-in. sizes, and assortment of mounts gives variety of positions possible for mounting.

A K Allen Co, 57 Messerole Ave, Brooklyn 22, NY

Special Press features

SPEED PRODUCTION



Model Mo6-12 Steelweld Press producing double off-set bends in pilaster panels. Accuracy is assured because of the deep ram and solid bed which extends below the floor. Length of bed is 16'-6".

It takes power to make long sharp bends. It takes size and design to assure accuracy. The Mills Company, Cleveland, Ohio, well-known manufacturers of fine metal partitions achieve both with their big 500 ton capacity Steelweld Press.

But more! They also obtain speed and safety. Their machine is provided with several features that are extremely advantageous:

1. Air-electric control for high production.
2. Electric foot switches for easy fatigueless operation.
3. Ram-positioning selector for stopping ram automatically at pre-selected points.
4. Two speeds, 7 or 21 strokes per minute for best operating speed.
5. Reversing flywheel for quick stopping or reversing of ram at any point.
6. Safety dual control permitting operation only when both operators are ready.

The Mills Company are proud of their modern Steelweld Press. It is the largest of several press brakes in their plant. It is in continuous operation, two shifts a day.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

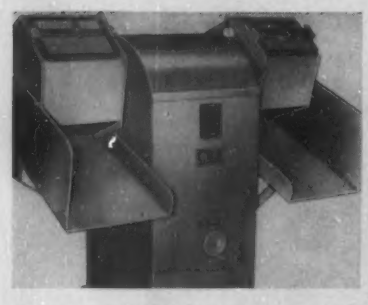
THE CLEVELAND CRANE & ENGINEERING CO.

1420 EAST 281st STREET, WICKLIFFE, OHIO

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING



Twin Barrel Finisher Uses Movable Chute

Rampe twin barrel finisher uses movable chutes under barrels which can be tilted to rear to drain off liquids and then can be tilted forward to deliver load to proper containers. When chutes are tilted to rear while machine is in operation, they form an effective guard around moving barrels.

Twin barrels on this finisher have load capacity of 1.1 cu ft each. It is powered with ¾-hp, 220/440-volt, three-phase motor. Barrels may be furnished unlined or lined with vinyl plastic.

Rampe Mfg Co, 3320 St Clair Ave, Cleveland 14, Ohio

Plastic Foam Materials

Eccofoam is a series of low-density, rigid, unicellular, thermosetting plastic foam materials with wide range of bulk densities. Material has thin skin on outer surface, is normally supplied in 30x18-in. sheets with thicknesses of 1, 2, or 3 in. It is reported that it can be readily machined.

Emerson & Cuming, Inc, 869 Washington St, Canton, Mass

Machinery Mounting Pad

The pad is reported to have greater firmness or density than similar mounting pads for machines that must remain extremely level during operation. Designated Type T Unisorb, material is available ⅜ in. thick to carry load of 75 to 125 psi. Material is completely resistant to petroleum products, mild acids, and moisture conditions.

The Felters Co, 210 South Street, Boston 11, Mass

Rubber-Based Sealer Applied As Strip

Extruded rubber-based sealer with 100% solids content that expands uniformly over length of sealer bead when heat cured is applied in form of flexible rubber strip. Designated EC-1209 it cures and expands when heated to form positive gasket-like material between metal surfaces, sealing out water, dust, and dirt, and acting as a cushion.

Advantages stated are: can be used to seal seams not uniform in width; no special flow or pressure application equipment needed; no time required for solvent evaporation; no waste of material; large gaps filled without sealer flowing from behind metal; excess sealant does not flow out when parts are drawn up tight.

The Adhesives & Coatings Div, Minnesota Mining & Mfg Co, 423 Piquette Ave, Detroit 2, Mich

Sundstrand Air Sander Is Fast Orbital-Type

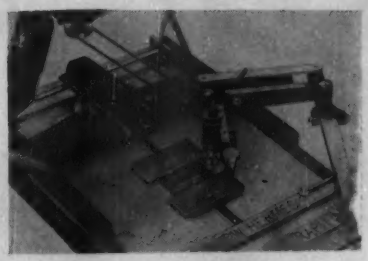
Speed of operation of 6000 cycles per min makes Sundstrand orbital-type air sander ideal for rough sanding and preliminary operations. It has built-in water attachment for wet sanding and unique pad control eliminates side sway. Ease of operation is assured by prominent control on top of unit which operates both air and water by slight downward pressure.

Unit weighs only 4½ lb, and air consumption is 5½ to 7 cfm.

Sundstrand Machine Tool Co, Pneumatic Div, Rockford, Ill

Cylindrical spring pin of AISI 420 said to withstand 100-hr salt spray test for corrosion, and meets AMS 7207. "Rollpin" has same physical specifications as previous models. Typical uses are: pinning gears to pulleys or shafts; hinge pins; dowels; replacements for cotter pins; and as shafts for small gears.

Elastic Stop Nut Corp of America, Union, NJ

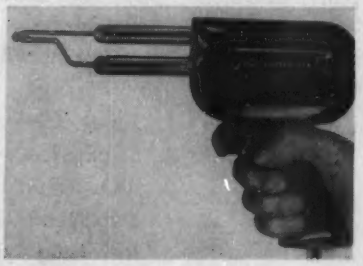


Hermes Engraving Machine Uses Portable Chassis

Model I-L has a portable chassis which may be lifted off base, taken anywhere in plant and set directly on work surface. It was designed for engraving panels, dials, nameplates, signs, and similar items, and is no larger than a typewriter. Quick-acting work holder clamps any size panel of steel, plastic, or wood.

Adjustability of copy-holding slides enables operator to engrave nameplate with several lines by simply adjusting movable copy-holding slides to any spacing desired. Patented pantograph arrangement allows changing of ratios by sliding operation without any disassembling. Automatic depth regulator with micrometer attachment guarantees uniform depth. Complete machine sells for $275.

New Hermes Engraving Machine Corp, 13-19 University Place, New York 3, NY



Soldering Guns Handle Up to 275 Watts

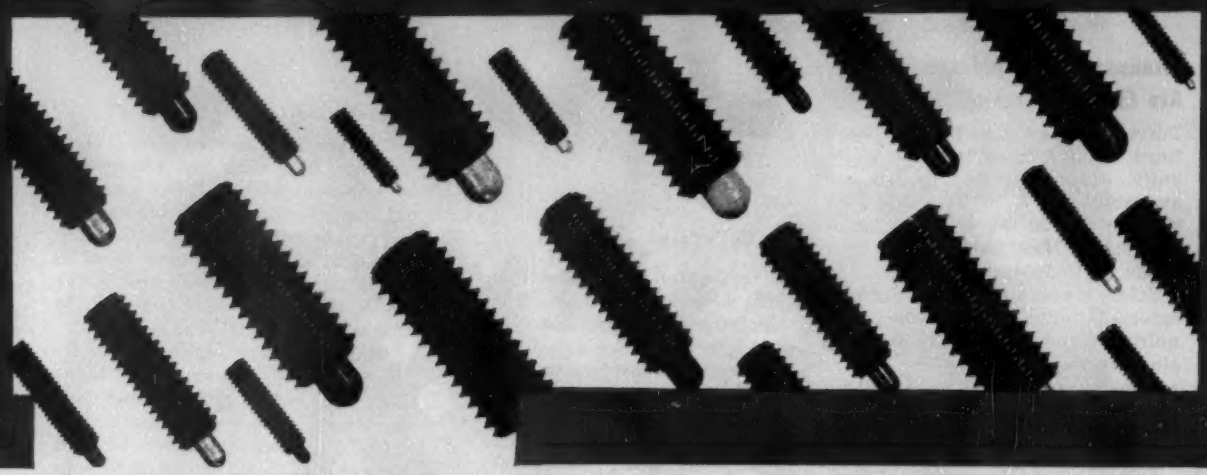
Heavy-duty Model D-550 soldering gun is designed to handle wide range of industrial soldering jobs. Features include 5-sec heating and tip-fastening arrangement which assures full constant heat. Dual heat feature affords extra capacity when required.

Weller piston-grip has been centered under housing for better balance. All models are equipped with dual spot lights.

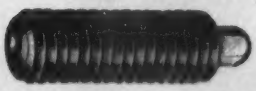
Two industrial models are available; the single-heat 250 watt, or the dual-heat 200-275 watt.

Weller Electric Corp, 808 Packer St, Easton, Pa

spring plungers



Wherever positive spring tension is required!

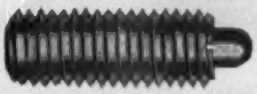


HEXNOSE

Hexagonal end simplifies adjustment and removal.

Standard Hex End: 4 sizes from ¼-20 to ½-13, with end pressures of 8 to 12 lbs.

Silvernose Hex: 4 sizes from ¼-20 to ½-13, with lighter end pressures of 2½ to 6 lbs.



STANDARD

Wherever positive spring tension is required . . . Facilitates fast loading and unloading of jigs and fixtures.

Standard End: 10 sizes from #6-32 to 1"-8, with end pressures of 3 to 42 lbs.

Silvernose: 7 sizes from #6-32 to ½-13, with lighter end pressures of 1 to 6 lbs.

Whether your production is routine or specialized you will find Vlier "performance proven" plungers are "uniformity assured" to do a better job. They speed set-ups, assure accurate machining and curtail unnecessary waste. When re-surfacing a die, Vlier Spring Plungers save hours of toolmakers' time.

There are 37 different types and sizes, each engineered for a specific need. Other sizes added when required.

Distinctive ends (light for light pressures, dark for heavier pressures) assure positive, quick identification.

Factory pre-set end pressures provide secure contact at all times. Inset hexagonal ends allow simple, quick adjustment with standard Hex key as well as permitting full utilization of screw length for better adjustment.

Screw portions are machined from selected steel alloy, plunger is case hardened; both are rust-resistant and can last a lifetime.

An assorted stock of Spring Plungers on hand assures greatest economy for it provides your tool engineers with a selection of the proper size and end pressure for every tooling requirement.

new!

PLASTIC NOSE

Designed for work with aluminum, brass and other relatively soft, easily marred metals.

Type A (dark): 6 sizes from #8-32 to ½-13, with end pressures of 5 to 12 lbs.

Type B (light): 6 sizes from #8-32 to ½-13, with lighter end pressures of 1½ to 6 lbs.

For catalog and address of your nearest distributor, write:

VLIER ENGINEERING

4552 BEVERLY BOULEVARD
LOS ANGELES 4, CALIFORNIA

TORQUE THUMB SCREWS • SPRING PLUNGERS • SPRING STOPS • FIXTURE KEYS • TOGGLE PADS

Swanson Turret Indexes Are Clutch Operated

Turret indexing units provide dwell times ranging from 0.835 sec to infinity. Clutch-operated models are available with 8, 16, 24 or 32 work stations and 20, 30, or 40-in. turret diameters. Max indexes per hour range up to 2154.

Solenoid-operated clutch drive is especially suited to applications requiring variable or infinite work cycle. Where drilling cycles require automatic control, limit switches may be used to prevent indexing before given operation is completed.

Additional information is contained in manufacturer's bulletin TC-5.

Swanson Tool and Machine Products, Inc, Erie, Pa

Barrel Finishing Chip

Novaculite is reported by the manufacturer to have unusually long life to reach hard-to-get-at indentations without wedging or clogging holes, and to produce a fine finish to close tolerances with uniform radii on all edges of the work.

The chips have a conchoidal shape, irregularly formed with sharp edges and elongated points. Particular advantages are claimed for finishing parts to be used in electronic assemblies or parts to be used for plating.

Chicago Wheel and Mfg Co, 1101 W Monroe St, Chicago 7, Ill

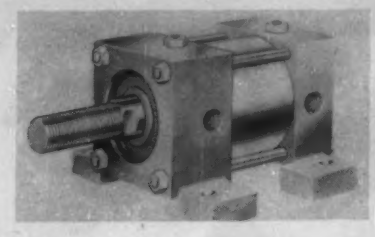
Surface Casting Resin Provides Ease of Mixing

L-930 Toolplastik material was formulated to provide complete ease of mixing. Metal filler is suspended in hardener and no hardener mixing is required. Resin is added to hardener container which provides room for mixing the two ingredients. Five minutes of mixing and resin is ready for use.

Characteristics stated by Rezolin include: metallic appearance, exceptionally low viscosity when mixed, two to four-hour hardening time at room temperature, non-corrosiveness, and excellent metal-bonding properties.

In addition to its use as a surface casting resin L-930 can be brush applied for glass-cloth lamination.

Rezolin, Inc, 5736 West 96th St, Los Angeles 45, Calif



Air Cylinders

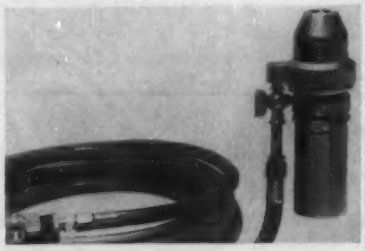
Air cylinders are available in five types of mountings and eight bore sizes from 1½ to 6 in. The cylinders, especially suited for automation applications, are designed to operate at pressures to 200 psi. Additional features include: large, hardened piston rods; double porting for extreme high speeds; extra-long cushion; interchangeable check and cushion adjustment valves; rolled-steel end plates.

The S-P Mfg Corp, 12415 Euclid Ave, Cleveland 6, Ohio

Setscrew

Top thread of Zip-Grip self-locking setscrew has been removed, making locking action take place only where uniform tapping has been done.

Set Screw & Mfg Co, Bartlett, Ill

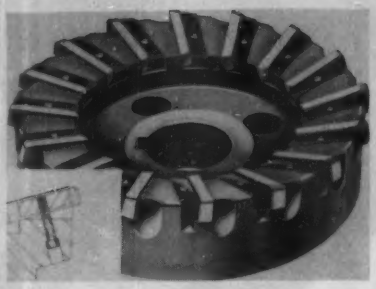


Sanstorm Nozzle Head For Wet Sandblasting

Sanstorm WH-2 mixes water, sand and air-pressure prior to being forcibly discharged. Water is injected by venturi action into the dry-abrasive stream. Unit is adaptable to any sandblast hose and gets its water supply from any source.

Nozzle head is made of aluminum and designed without moving or wearing parts.

Sanstorm Mfg Co, Santa Clara and H Sts, Fresno, Calif



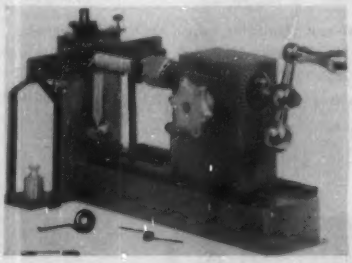
Face-Milling Cutter

Solid-carbide inserted-blade face-milling cutter mills cast iron, malleable iron, and brass. It has a greater number of solid carbide blades than previously supplied and permits use of higher speeds and faster feeds to attain higher production and better finish, but construction is similar to that of Super's IBH face mill.

Blades are extra heavy and are arranged radially for maximum blade life. They can be reversed and used in either right- or left-hand bodies.

Cutter is available in five standard sizes of 6, 8, 10, 12, and 14 in. in both right- and left-hand types, as well as in specials.

Super Tool Co, 21650 Hoover Road, Detroit 13, Mich.



Torsion Spring Tester

Universal tester checks loads and deflections of torsion, double torsion, spiral, clock, and power springs. It can be used for high-quantity testing of torque and angular travel at speeds of 300 to 600 tests per hour.

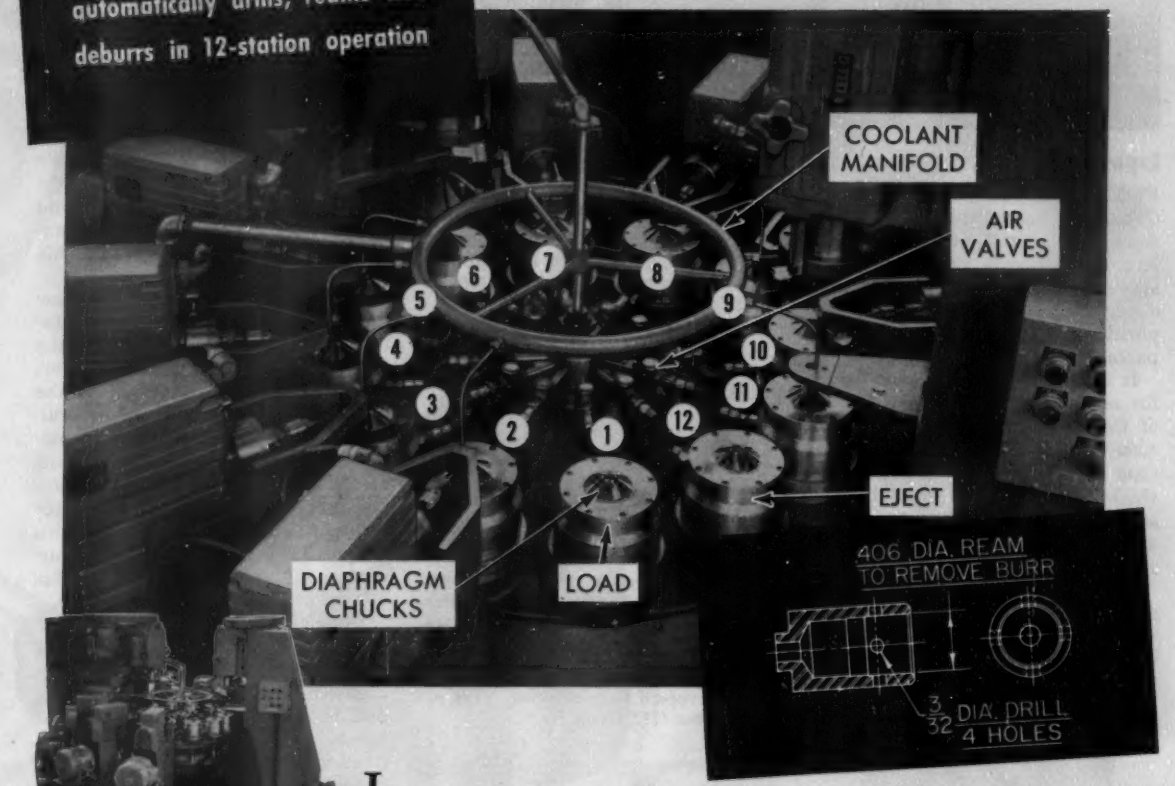
It meets requirements of National Bureau of Standards for precision scales and is guaranteed accurate within ¼ of 1%. Capacity: torsion springs having wire diameter from 0.005 to 0.125 in., from 1/16 to 6-in. lengths. Can be tested for torque from ¼ in.-oz to 48-in.-lb.

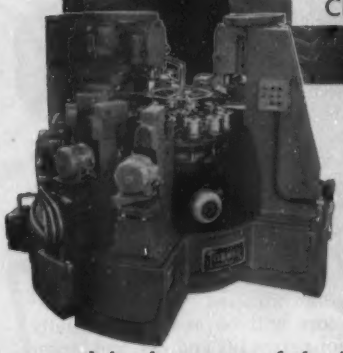
Size is 9x11x15¾ in. Accessories include 15 arbors, 1/16 to ½ in.; block of weights ¼ in.-oz to 4 in.-lb; ⅝ in.-lb weights and two adapters for small springs.

The Carlson Co, 277 Broadway, New York 7, NY

1400 WORK PIECES PER HOUR at 100% EFFICIENCY!

Special-purpose Turner Machine automatically drills, reams and deburrs in 12-station operation





LOADED at *station 1*, the work piece is automatically clamped in a diaphragm chuck by means of air valves mounted in the center of the indexing table, then indexed to *station 2* where one 3/32" dia. hole is drilled while operator loads another part. Indexing to *station 3*, the diaphragm chuck rotates 90° and another 3/32" hole is drilled. The same operation takes place at *stations 4 and 5* while the indexing and loading cycle continues.

At *station 6*, a .406" dia. hole is reamed by a vertically mounted reamer, removing the burr caused by drilling. At *stations 7, 8, 9* and *10*, the drilling operation is repeated since the reaming causes some of the burrs to be pushed back into the 3/32" holes. This redrilling pushes the burr back into the .406" hole and is finally removed entirely at *station 11* by a duplicate vertical reaming operation. At *station 12*, the part is automatically ejected by means of a cam attached to the indexing table.

All components of this machine are standard: base, columns, "Hautau-Turndex" indexing table, drill units and diaphragm chucks. Should you stop production of one kind of part and contract to produce another, the Turner machine, with its standard components, can be used again on your new job.

If you have a production or inspection problem for which you can use to advantage a special purpose machine, write today describing your problem. After our engineering department analyses it, our field engineer will discuss it with you.

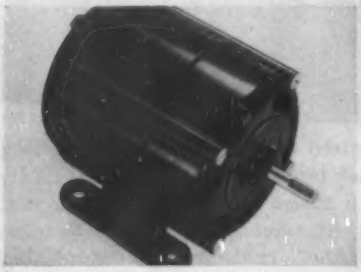
TURNER BROS. INC.
2625 HILTON ROAD
FERNDALE 20, MICHIGAN
DESIGNERS and BUILDERS of:
• SPECIAL MACHINES
• JIGS and FIXTURES

Exposure Shield

PES exposure shield is for use in Cobalt 60 radiography. It was designed to permit safe handling of strong radioactive sources for three specific requirements; exposures in internal locations, radiography where electric power is not available; and panoramic exposures.

It is available in two models, 202 for safe handling of 2000 millicuries of Cobalt 60, and 402 for handling 4000 millicuries. Both models consists of three basic units: source shield, lead-filled steel shell in which source is stored; source tube, flexible and adjustable to 21 ft; 25-ft control cable.

Technical Operations Inc, 6 Schouler Court, Arlington, Mass



Series Motor

Model 512 Series Motor, also available as a shunt motor, is die-cast from Zamak No. 3 and held to close tolerances. Housing is ripped and either porous or bronze self-aligning sleeve bearings with oversize felt oil reservoir or precision grease sealed ball bearings are available. It is made in both open and closed construction and internal fan is optional.

Optional features include: 10 different Howard gear units with wide range of ratios; automatic governor controls for two speed, single speed or adjustable speed; automatic or manual motor protector can be built into housing. Motor can be mounted on base or face mounted.

Howard Industries, Inc, Racine, Wis

Induction Heating Unit Bonds Multi-Strand Wire

Portable tube-operated induction heating unit was designed to bond together the individual strands of multi-strand wire and cable to prevent ends from becoming frayed or loose. Process is reported to eliminate necessity of tin-dipping ends after cutting and stripping.

Used at Federal Telephone and Radio in conjunction with automatic wire cutting and stripping machines, wire is fed continuously through load coil of generator and heating cycle is synchronized with stroke of wire cutter. Wire is heated and bonded at successive points. Model contains stepless power control.

Lepel High Frequency Laboratories, Inc, 55th St and 37th Ave Woodside, NY

PORTABLE ELECTRIC BLOWER will reduce motor troubles and time required to clean motors, machines, and switchboards. New models, designated NA, features heavier duty 1-hp motor without any increase in total weight of 14 lb, over-all size, or price — *The Ace Co, P O Box 1212, Ocala, Fla*

Electronic Telephone Instrument Available

Fonadek, a device that occupies only a few square inches of desk space, holds the telephone and frees your hand to enable you to leave the desk and converse at the same time. Unit needs no plugging in, no installation; runs on ordinary batteries. Price is $59.95 FOB Boston.

Fonadek, Div Special Devices, Inc. Boston, Mass

Allis-Chalmers Motors Meet NEMA Standards

Allis-Chalmers' line of alternating current squirrel cage induction motors in frame sizes up to 326 have been designed to meet the new NEMA standards. Both open and totally enclosed (fan cooled and explosion cooled) models are available in the new line.

The company states that the new motors, designated Type G, will retain all important features of the company AP line while offering certain improvements inherent in the redesign. A 5-hp, 1800-rpm general-purpose drip-proof squirrel-cage motor built on the present 254 frame meets the following standards: temperature rise, 40C; locked rotor torque, 185% min; breakdown torque, 225% min; locked rotor current at 220 volts, 90 amps max; slip, 5% max; and service factor, 1.15.

Models have cast iron frames and end shields and rotors are pressure-cast of aluminum. Bearings are grease-lubricated, medium series, double-shielded ball bearings which can be relubricated without dismantling motor. Stator windings are of random wound type of heavy Formvar-coated wire in semi-closed slots. Stator will receive multiple dips and bakes to assure protection against moderate amounts of moisture, weak acids and alkalies.

Motors will be available initially in frame sizes 182 and 184, and larger frame sizes will be introduced at approximately five-month intervals.

Allis-Chalmers, Milwaukee 1, Wisconsin

Industrial Flooring

Industrial flooring process named Metal-Seeded Dynapakt is said to add strength of iron to heavily-traveled concrete floors. An 8-in. veneer of iron-chip aggregate is installed as a non-spalling, non-crumbling, non-slip armor over fresh concrete topping. Operation is performed with heavy-duty power equipment to insure maximum compaction and adhesion of concrete and metal.

Flash-Stone Co, Inc, 3723 Pulaski Ave, Philadelphia 44, Pa

See How FORGINGS CAN SAVE MONEY

(Below) This forged brass part was originally made from a casting and a tube, silver soldered, as indicated in the drawing. Forgings can save a lot of money!

(Above) Brass part as now forged in one piece. Drawing shows how it was originally made in three pieces, two made of tube and the other from sheet, silver soldered.

Photos of forgings shown are approximately 3 times larger than actual size.

The two brass parts shown here were originally built up out of separate pieces, silver soldered together. That was the difficult and expensive way. Then the manufacturer and Revere worked together to see if forgings could not be used. Designs and dies were worked out, and for a number of years Revere has kept a steady flow of these parts going to the customer. He reports that the forgings not only save money, but are superior: stronger, more dense, with a better finish, and machining is faster and easier.

If you have sub-assemblies made of several parts, look into forgings. They may offer important economies. Revere makes forgings in copper and its alloys, and aluminum alloys. See the nearest Revere Sales Office.

REVERE

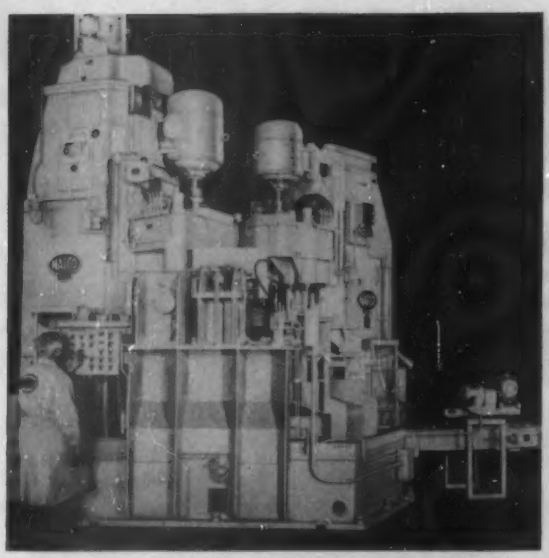
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

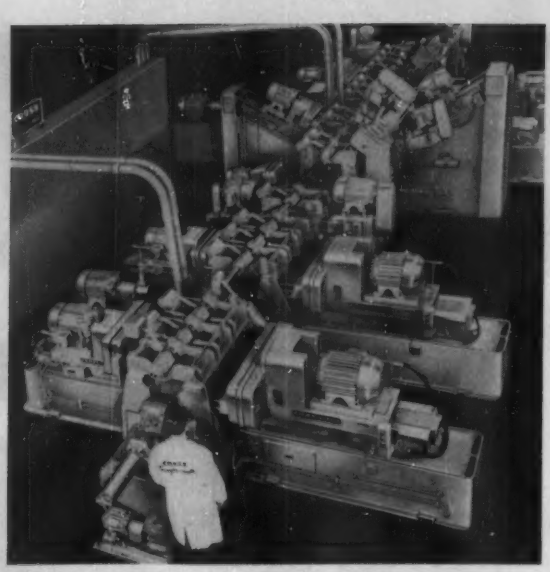
230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS



TRACTOR TRACK LINK BUSHINGS have cores drilled and reamed on this automatic multiple-spindle vertical indexing machine which handles six different size bushings. Depending on size of part, production ranges from 270 to 400 parts per hour. It incorporates five-position indexing table, two vertical-spindle heads with 20 chucks, and automatic load and unload mechanisms. It is equipped with remote control panel for pushbutton operation which automatically sets up indexing and machining cycles. Parts are made from seamless steel tubing stock and approximately 1/16 in. of stock is removed in the core drilling and reaming operations — *The National Automatic Tool Co, Richmond, Ind*



TRANSFER-MATIC MACHINE with 29 stations processes automatic transmission housings at 100 parts per hr. Operations include drilling, chamfering, end milling, counterboring and reaming and tapping. Machine performs 90° indexing of part in station 14 for drilling sides and top in subsequent stations. Preset tools and Cross machine control unit with Toolometers are used for programming tool changes. Other features include: automatic transfer from station to station; hydraulic feed and rapid traverse; individual leadscrew feed for tapping; hardened and ground ways, and gravity operated cam clamping. Hydraulic and electrical construction conforms with JIC — *The Cross Co, Detroit 7, Mich*

All-Purpose Dolly

Designed originally for test setups using Browning oscillosynchroscopes, dolly has many uses in laboratory and on production line. Two shelves provide space for multiple test equipment combinations.

Basic dolly consists of steel shelves 24x24 in. rigidly mounted in framework of chrome plated tubular steel. Four 3-in. casters, two with brakes, provide mobility. Basic price is $49.50.

Accessories include: drawer assembly with provisions for lock; five-position bar lift which tilts scope; power outlet strip.

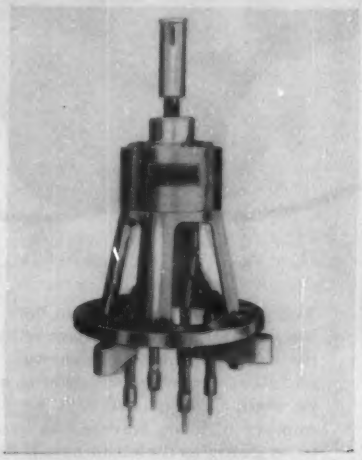
Browning Laboratories, Inc, Winchester, Mass

Steel Caster Is Non-Locking

Non-locking steel caster is reported to require less effort to start, to roll easier, to turn and pivot easier, to take rough-surface floors with less vibration shock. The company states that it positively will not lock or jam in any position, even under maximum load.

It employs a curved axle with dual ball bearing sockets that give free movement from any position. It is available in standard 1½ to 2½-in. wheel diameters with either welded or screw-type bearing plate.

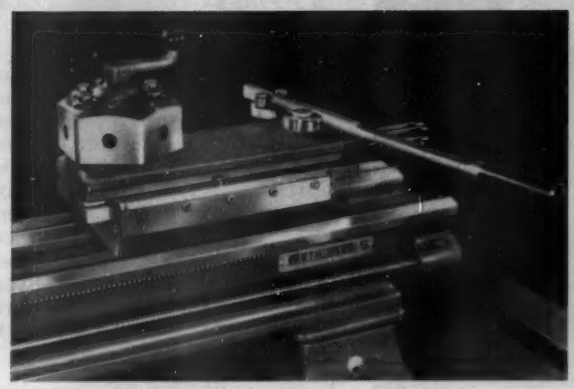
Rolawheel Co, 1757 West Grand Ave, Chicago, Ill



UNIVERSAL JOINT TAPPING HEAD is reported to enable user to speed up production and to insure greater accuracy. It is available in two sizes: No. 0, 0 to ¼-in. tap capacity, 4 and 6 spindles; No. 1, 7/32 to ½-in. capacity, 4, 6, and 8 spindles. Heads are made of sand-blast aluminum with hardened ground gears and spindles. Ball thrust bearings at all thrust points are fully grooved — *Errington Mechanical Laboratory, Inc, Staten Island 4, NY*

Simplify Repetitive Operation
WITH
SOUTH BEND TURRETS

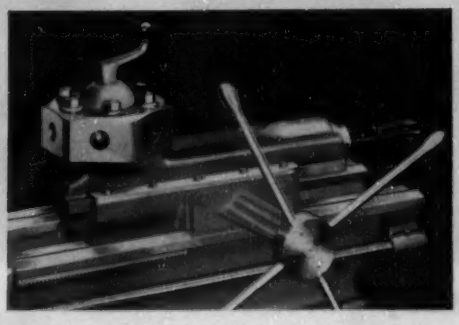
Precision-built for precision work, these South Bend Turrets simplify tooling for repetitive operations that must be held to very close tolerances. Their rigidity and accuracy permit use of maximum cuts and spindle speeds. They are representative of 165 attachments, tools and accessories that are designed for South Bend Lathes. Use them to simplify routine operations or to tool up special jobs economically. Reasonable prices enable you to do this profitably — another reason for using South Bend Lathes. Write for Attachment Bulletin 5321.



HANDLEVER BED TURRET

Mounts any place on bed. Indexes ± .0005" at 4" from turret face Hardened, ground and superfinished index pin. Indexes automatically. Automatic feed stop for each position. Effective slide feed 4". Tool holes ⅜" or ¾".

Size Lathe	Catalog No.	Price
9"	CL1611N	$273.
Light Ten	CL1611K	280.
10"	CL1611R	286.
13"	CL1611T	308.



HAND FEED TURNSTILE BED TURRET

Mounts any place on bed. Indexes ± .0005" at 4". Hardened, ground, superfinished index pin. Indexes automatically. Automatic feed stops. Effective slide feed 5⅞". Holes for 1½" tool shanks.

Size Lathe	Catalog No.	Price
16"	CL1917H	$683.

HANDLEVER TURRET

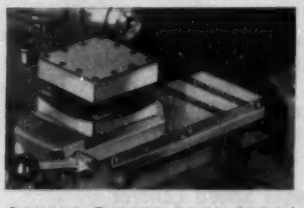
Replaces tailstock. Index lock releases automatically. Automatic feed stops. Manual indexing of turret. Holds 6 tools with ⅜" shanks. Maximum stroke length of turret slide is 3¾".

Size Lathe	Catalog No.	Price
9"	CL2045N	$116.
Light Ten	CL2045K	123.
10"	CL2045R	134.
13"	CL2045T	161.

SQUARE TURRET TOOL BLOCK
for Compound Cross Slide

Mounts 4 cutting tools. Turret indexes within .0005" to 4 positions. Quick acting lever lock.

Size Lathe	Catalog No.	Price
9" & 900	CL3375N	$46.00
Light Ten	CL3375K	48.50
10" & 1000	CL3375R	52.00
13"	CL3375T	58.50
14½"	CL3375F	84.00
16" & 2-H	CL3375H	91.00



SQUARE TURRET TOOL BLOCK
for Double Tool Cross Slide

Mounts 4 cutting tools. Turret indexes within .0005" to 4 positions. Quick acting lever lock. Rocker adjustments for tool height.

Size Lathe	Catalog No.	Price
9" & 900	CL3376NR	$41.50
10", 1000	CL3376NR	41.50
Light Ten	CL3376K	41.50
13"	CL3376T	57.00
16" & 2-H	CL3376H	85.00

All prices f.o.b. factory

Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 18 months.

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES

☐ ½" & 1" Collet TURRET LATHES

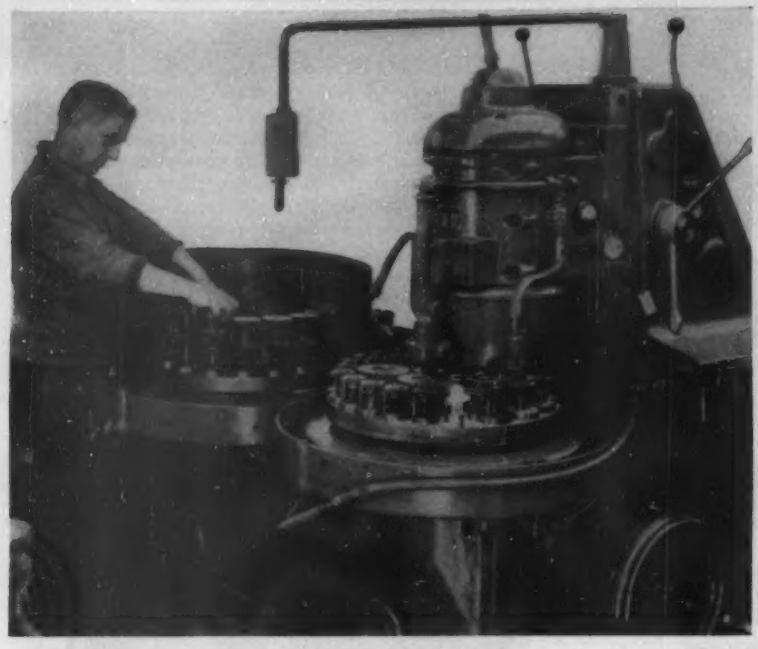
☐ TOOL GRINDERS

☐ 7" BENCH SHAPERS

Name _____

Street _____ City & State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



Rotary Surface Grinder Features Double Table

Strasmann-Enke grinder has two rotary magnet tables carried on knees in front of bed. Sliding on top of the bed is a grinding head with vertical spindle, traversed by power over each table in turn.

Headstock spindle is shifted hydraulically into grinding position. Each knee is equipped with large handwheel with easy to read calibration. Rotary tables are brought into contact with grinding segments by these handwheels.

Automatic feed ranges from 0.00004 to 0.0004 in. per turn of table. Rotary tables have max speed of 75 rpm and max grinding table speed is 328 fpm. Unit is made in two sizes with 20 and 24-in.-dia rotary tables.

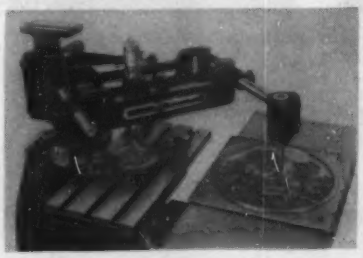
Imported by Hancor, Inc, 262 Mott St, New York, NY

Variable Speed Control For Motors to 3 hp

Electronic variable speed motor control systems range from 1/15 to 3 hp and make use of special terminal block transformer construction, and critical-component plug-in assemblies.

Design uses series field as torque signal source in feedback circuit to provide constant system torque capability. Controlled acceleration on many models allows use in application of high inertia loads. Fingertip-controlled models for manual speed selection at remote points are available, as well as line of automatic Dial-A-Speed systems. Automatic tension control, constant surface speed wind-up and other automatic models have been announced as well as memory-type systems operating from magnetic tape recorders.

The Brown-Brockmeyer Company, Dayton, Ohio



Preis Engraver is Termed 3-Dimensional

Engraving machine will engrave steel as well as other metals, plastics, and wood in ratios ranging from 1.7 tc 1, to 7 to 1. Is designated the Preis-Panto Model 3D-5 engraver and construction enables reversing above ratios by simple alternation of spindle and tracing stylus.

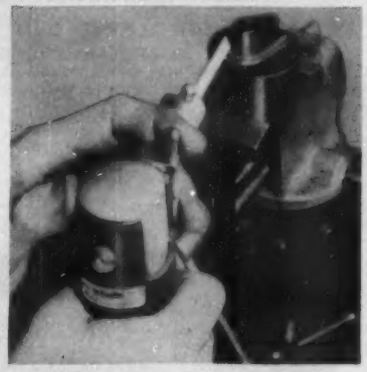
Spindle speeds are 5000, 7000, 9000 and 12,000 rpm. The company states that the engraver is particularly suitable for work ranging from steel stamp and die lettering to sizes up to ⅛ in. and larger.

Unit is furnished complete with 1725-rpm ball bearing motor, 115 volt ac, 60 cycle, and all standard attachments including: worktable, clamps, copy holder, spindle, collet, belts, pulleys, cutters, grease gun and wrenches.

H P Preis Engraving Machine Co, 16 Industrial Branch, Hillside, NJ

Lightweight safety goggles (just more than 1 oz) provide protection on top and sides, as well as from front of the worker's eyes. An extension of the frame fits against the wearer's forehead, and flanges extend from lenses to cheeks. One universal size, adjustable to each person's needs. Methacrylate lenses. Available in clear, and three shades of green—light, medium, and dark.

Watchemoket Optical Co, Inc, 232 W Exchange St, Providence, RI



Di-Profiler Rocks As It Hones

A clamp that is positioned and tightened by thumb-screw permits hone or file of improved Di-Profiler to be rocked or rotated to conform with contour of die or part being worked. Regulated reciprocating stroke of from 0 to ¼ in. can be operated at any desired speed from 0 to 15,000 spm by foot control.

Rocking feature and stroke control make this a high-production substitute for hand filing. Unit is said to be practically vibrationless and effortless due to precision construction and the four ball bearings in spindle and drive head. Spring compensator allows for human imperfection when longer stroke than needed is being used. Stroke adjustments are made by removing aluminum cap and turning calibrated adjustment screw to the precise stroke desired.

Nord International Corp, 449-5 Central Ave, Orange, NJ

BOTH ARE OILS—

BUT ONE'S A MASTERPIECE!

In Lubricating Oil, too, there's no substitute for Quality!

"Look-alikes"—in lubricating oils as in oil paintings—can fool you. But they can't fool a machine. Famous Gargoyle oils prove this point.

You can copy the physical specifications of a Gargoyle oil, but you can't copy the 88 years of experience and skill that transform these specifications into products of unsurpassed quality. Vary the ingredients or the way they're compounded even slightly, and you wind up with an oil that, at best, may do no harm. But neither can it possibly bring you the benefits the original was designed to deliver.

This *inherent quality* is only part of the Gargoyle picture. With it goes the world's greatest lubrication engineering service. We analyze your plant machinery—work with your personnel to set up a complete program of *Correct Lubrication* that will improve your production, cut maintenance costs.

Why accept substitutes for *your* plant?

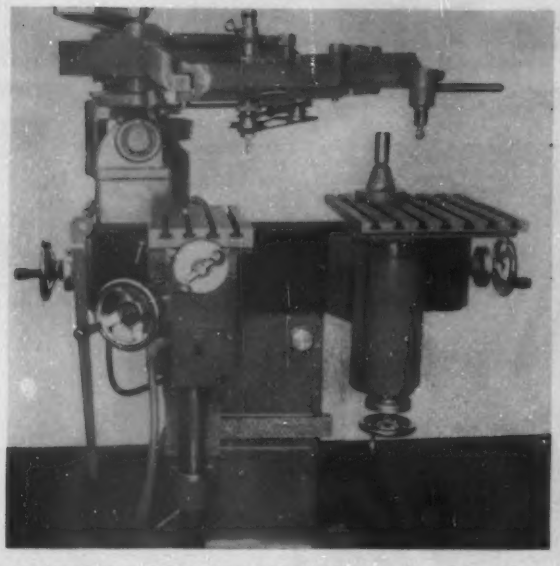
SOCONY-VACUUM

SOCONY-VACUUM

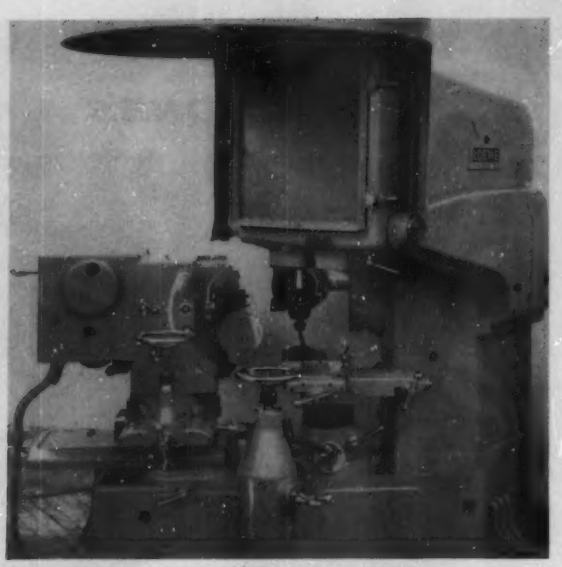
Correct Lubrication

FIRST STEP IN CUTTING COSTS!

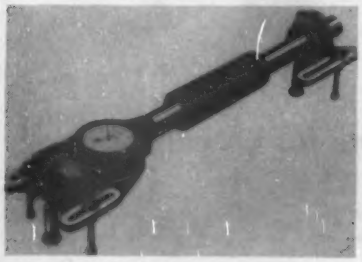
SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



UNIVERSAL DIE-SINKING MACHINE, produced by Alexander Machinery, Ltd, is designed for production of molds and dies in either 2 or 3 dimensions where irregular forms are of primary importance. Maximum weight of workpiece is 1000 lb and ratios range from 1.5 to 1 to 10 to 1. Features include 14 spindle speeds from 475 to 9500 rpm; spindle provided with standard ball races holding cutters up to ⅜ in. dia. Distance from top of worktable to cutter point with pantograph horizontal—with worktable in lowest position, 14½ in.; with worktable in line with top of column, 7⅞ in. Other specifications include: vertical feed of copy holder, 8½ in., worktable size 8x14 in.; vertical feed of worktable 14½ in.; longitudinal feed of work table 17⅜ in., cross feed of worktable 6 in.—*Imported by J Arthur Deakin & Son, 150-28 Hillside Ave, Jamaica 32, LI, NY*



OPTICAL PROFILE GRINDING MACHINE, manufactured by Ludw. Loewe & Co, Berlin, is suited for precision form grinding of complex flat form tools, circular form tools, sectional dies, gages, templets, cams, and punches. Shadograph screen of 20x20 in. permits operator to follow with grinding wheel slides a line drawing of any contour. Grinding wheel workpiece and line drawing are visible at all times. Magnifications of 25X and 50X are provided. Maximum working area 2⅜x10 in. is provided through longitudinal and cross-displacement of working table. Two optical systems allow for shadograph-type and reflection projection. Area visible on screen represents workpiece area of ¾ in. square at 25X. Oscillating movement of grinding wheel slide as well as grinding wheel spindle are adjustable steplessly over full range — *Imported by Eric R Bachmann Co, 27-11 41st Ave, Long Island City 1, NY*



Universal Gage for Shallow Diameters

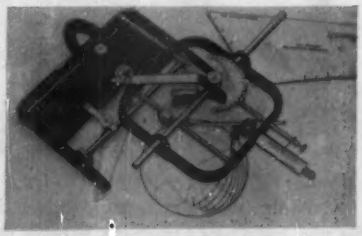
Model 88 P-10 Universal ID-OD gage, designed especially for gaging shallow bores and shoulder diameters, features easy adjustment and locating buttons which can be adjusted for height. It has a tubular frame, is light in weight, and is equipped with one or two insulated hand grips to prevent heat transfer from operator's hands. High degree of accuracy is said to be maintained through its rigid construction and elimination of flimsy joints.

The model has been designed so gages can be made from stock parts. Length of gage must be specified, can vary from 6 to 32 in. in 3-in. increments. Although each is furnished for specific diameter measurement at specific depth, certain adjustments are possible. Vertical adjustments can be made by moving rest buttons to place contacts at different depths, up to one inch. Reference contact can be moved along length of tube to measure smaller diameters than specified.

Federal Products Corp, 1144 Eddy St, Providence 1, RI

Spring lock fastener permits quick attachment and separation of welding mask and helmet without removing helmet from head. Metal post on each side of mask plugs into a lug fastened to each side of helmet. Device may be used with helmets and masks other than the Davis Hedgard safety helmet.

Davis Emergency Equipment Co, 45 Halleck St, Newark, NJ

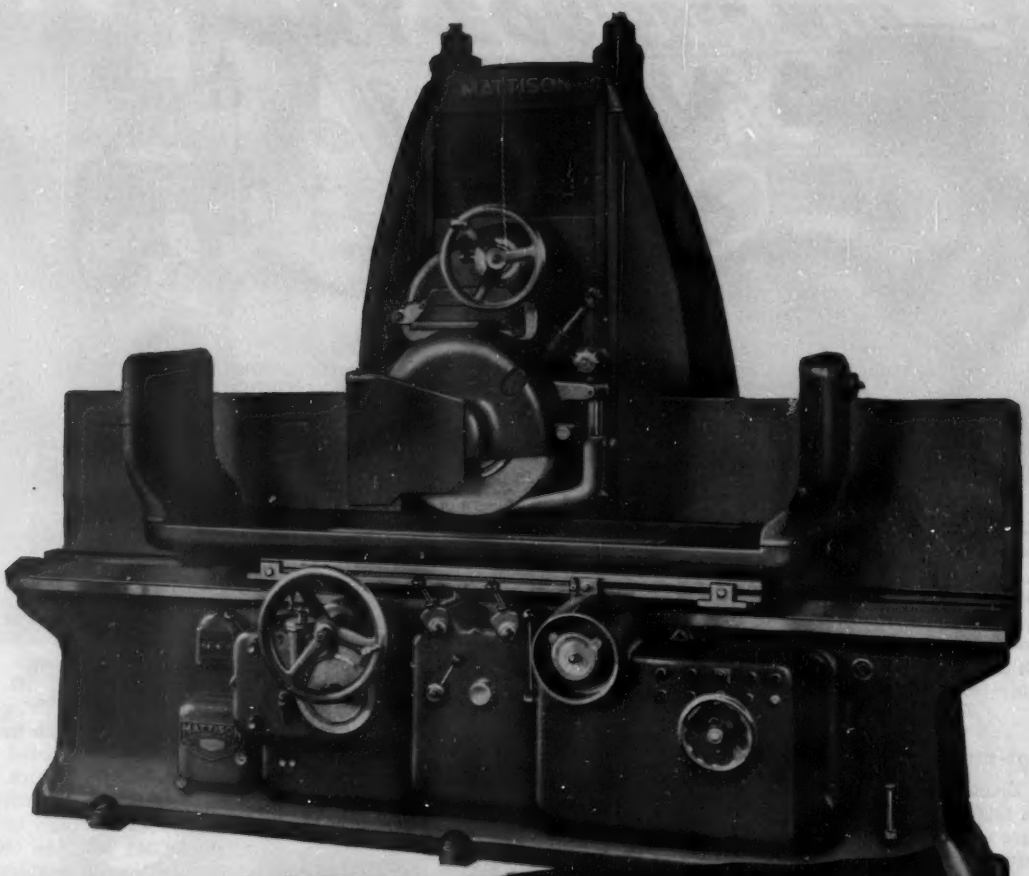


Circular Drawing Machine

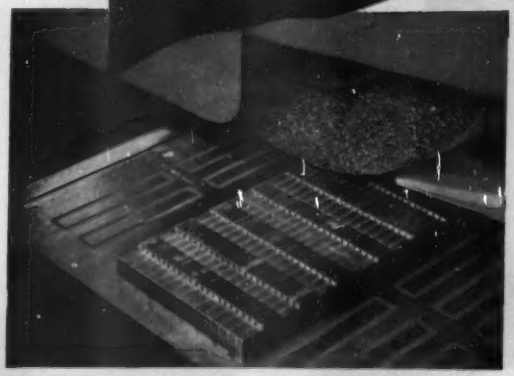
Drawing machine enables technical illustrators and draftsmen to make accurate pictorial drawings in less time than it takes to make plan view drawings, according to the manufacturer.

Two simple setings, one to establish major diameter, the other the minor diameter, enable the user to draw mathematically precise ellipses in any ratio by degrees or from points on drawing. Repeated and related ellipses on same axis are achieved through instruments rolling parallel action.

Charles Bruning Co, Chicago 41, Ill



HERE'S A CHANGE THAT INCREASED PRODUCTION FROM 30 PER HOUR TO 200 PER HOUR



Both sides of type-stamps are now ground 200 per hour on a Mattison Grinder. Previous production—30 per hour.

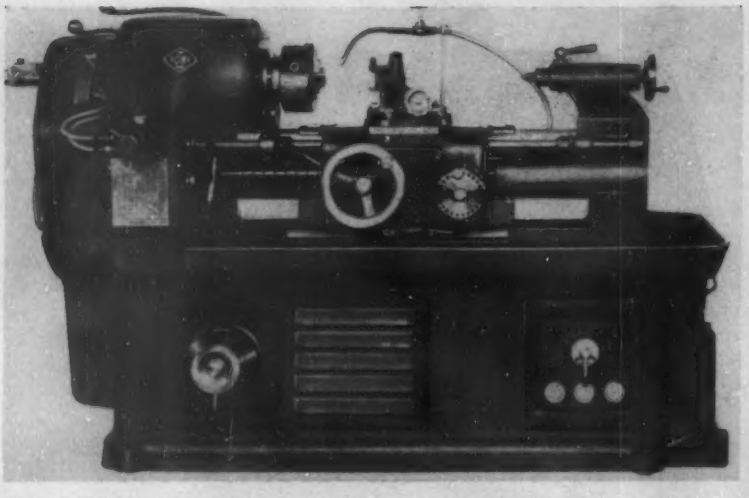
● Because of the greater load and grinding area of their **Mattison** High Powered Precision Surface Grinder, Geo. T. Schmidt, Inc., Chicago, Illinois have been able to effect considerable savings in grinding time over their previous method. As an example—the type stamps shown in the picture above were formerly ground a few pieces at a time on a small grinder—30 per hour. The Mattison Grinder they are now using provides larger table space and a larger grinding wheel together with the necessary power and stability to permit the grinding of more pieces per load at a production rate of 200 per hour. Similar results are obtained on other parts.

Mattison High Powered Precision Surface Grinders have the high power and rugged double-column construction for rapid stock removal and the precision necessary for high quality finish and accuracy to close limits.

This combination not only will enable you to step up production on small parts, but permits grinding large work which previously could not be handled. For further information send for free circular.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS



SINGLE-POINT THREADING lathe with automatic cycle is reported to be capable of fast thread-cutting operations. Machine, designated Thread-O-Matic, was designed for capacities of up to 18 in. in length and 6-in. dia. Cuts internal and external threads, left- and right-hand taper and multi-start. Cycle is fully automatic with cutting tool completing number of pre-set passes at pre-set speed and stopping at end of cycle. No special tooling is required. Working speeds are up to 2,000 rpm and rate of cutting can be more than 100 cuts per min —*Imported by S & S Machinery Co, 140—53rd St, Brooklyn 32, N Y*

Air-Operated Clutches

Type LK clutches are for machines where fast cycle and accurate stopping are essential. Low power losses in starting and stopping result from design insuring least possible inertia of driven parts and high heat-dissipating capacity. Built-in rotary seal and flow control valve provide fast clutch release with smooth, gradual clutch engagement.

Clutch can be used as air-set, spring-released brake by holding normally rotating drive ring and cylinder assembly stationary while friction disk is mounted on and revolves with shaft to be stopped.

LK clutches are built with single or double friction disks depending on torque requirements. Eighteen sizes cover max working torques 3300 to 430,000 lb-ft.

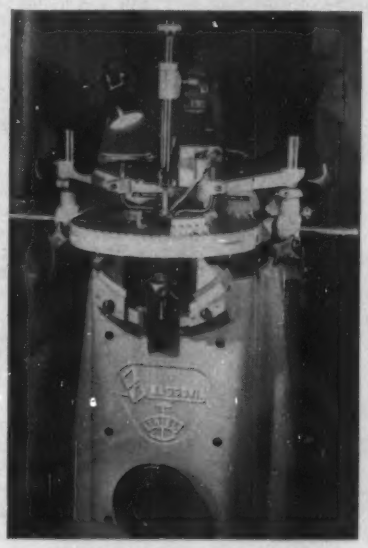
The Industrial Clutch Corp, Waukesha, Wis

Centrifugal Pump Has No Stuffing Box

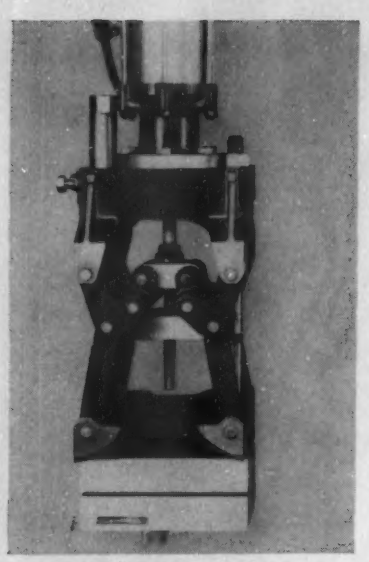
Chempump is a totally enclosed pump with no mechanical shaft-seal or stuffing box. Unit is self-lubricating and maintenance is reported to be practically non-existent.

Basis of design is enclosed rotor impeller. Radial magnetic drive actuates standard hydraulic impeller through relatively short solid shaft. Fluid circulates freely through the rotor chamber; stator is isolated from fluid by corrosion-resistant non-magnetic alloy cylinder inserted in the air gap. Rotor is hermetically sealed by same alloy. Unit is approved by Underwriters' Laboratory.

Chempump Corp, 1300 E Mermaid Lane, Philadelphia 18, Pa



RECIPROCATING FILING and sawing machine, Nassovia-Thiel Type 14, has number of strokes infinitely variable from 75 to 340 per min. Length of stroke is adjustable from 0 to 5 in. Changing files or saws is accomplished with an Allen wrench — *Imported by Carl Hirschmann Co, Inc, 30 Park Ave, Manhasset, NY*



Die-Casting Machine Has Independent Die Unit

DCMT IMP/96 die-casting machine incorporates independent die unit which enables operator to lift unit and die completely off machine and install a spare die unit which has die mounted on it. It is reported that the continuous operation which may be attained through use of this die unit, coupled with the high cycling speed of the DCMT machine (800 to 1,000 shots per hour), enables the manufacturer to use low-cost single or two-cavity dies and meet production requirements.

Imported by DCMT Sales Corp, 164 Duane Street, New York 13, NY

Tracer Templets

Treco process for producing tracer templets for use with all types of profile-tracing machine tools uses direct contact reflex photographic method of reproduction of original layouts. Layout of 10X or 20X size is made on coated templet layout stock and exact contact reproduction is then made on gage stock. Large reproduction is cut and filed to produce enlarged profile templet. It can then be put on profile grinder and full size final templet or workpiece made therefrom. This process produces high precision templets.

Templets for standard production follow the same first two steps. The templet is then finished by cutting and filing or grinding in the case of hardened templets. Finished templet is checked back against the original metal layout for accuracy.

Template Reproduction and Engineering Co, 401 N Broad St, Philadelphia 8, Pa

FACTORY-EQUIPPED WITH

A line-up of punch presses on the shipping floor of Julius Blum & Co., Carlstadt, N. J., all factory-equipped with A-B controls.

Machinery builders find the new 6th Edition, 120-page Handy Catalog a helpful guide in selecting motor controls for any machine. Let us send you a copy.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wisconsin

A-B Quality

THE ALLEN-BRADLEY *Trademark*—

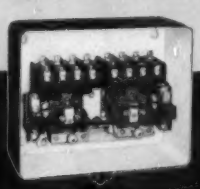
is a Guarantee of Trouble-free Motor Control and a Plus Value in Machine Tool Sales

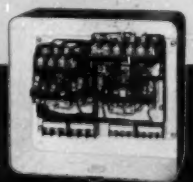
If you make motor-driven machines . . . which are sold "factory-equipped" with motors and controls . . . you assume over-all responsibility for, and can guarantee, the satisfactory operation of the whole machine. This fact can be converted into a powerful sales asset. By featuring Allen-Bradley controls on your machines, you provide assurance that the controls are of the best. Allen-Bradley starters, relays, and contactors have an established reputation for long, trouble-free life . . . they are good for millions of switching operations.

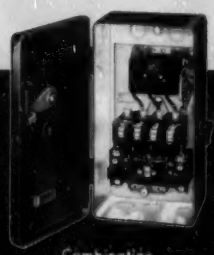
Allen-Bradley Size 1 Motor Controls—Rated 5 hp, 220 v; 7½ hp, 440-550 v.

Manual Starter

Automatic Starter


Reversing Starter


Multispeed Starter


Combination Starter

5-54-R

A-B Quality

ALLEN-BRADLEY

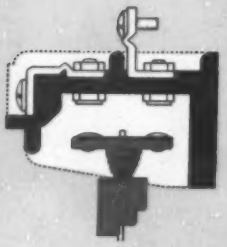
SOLENOID MOTOR CONTROLS

QUALITY

Bulletin 709 Starters are SO TROUBLE FREE

••• ••• *because they are* SO SIMPLE

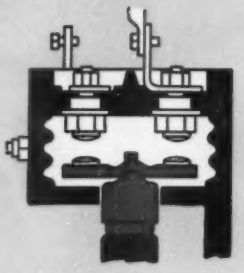
DOUBLE BREAK, SILVER ALLOY CONTACTS—NO MAINTENANCE



SIZES 0 & 1

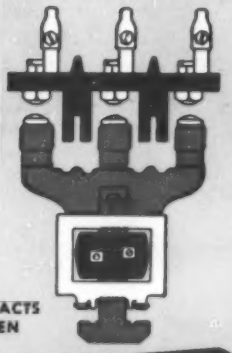
Some 20 years ago, when Allen-Bradley announced the new Bulletin 709 solenoid starter, a big feature was the change from single break, copper-to-copper contacts to double break, silver alloy contacts. A warning on the name plate said: DO NOT FILE, CLEAN, OR DRESS CONTACTS.

At first, maintenance electricians paid little attention to this request. Who had ever heard of running motor starters without contact maintenance? But, today, the dependability of Allen-Bradley starters is taken for granted. They have proved they are good for millions of trouble-free switching operations.



SIZES 2 TO 7

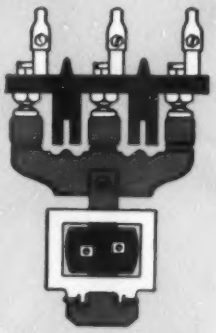
ONLY ONE MOVING PART—NOTHING TO RUST AND STICK



CONTACTS OPEN

The Allen-Bradley solenoid starter design was new and revolutionary in 1934. By doing away with clapper contactors, it eliminated hinged linkages, pivots, pins, and bearings. Only one moving part . . . the one-piece solenoid plunger . . . opens and closes the contacts with a simple up-and-down motion. Such simplicity assures unfailing operation.

Today, millions of Allen-Bradley solenoid relays, contactors, and switches are in active use. They have set a standard of performance which has expanded the use of automatic controls. Allen-Bradley solenoid controls sustain almost unbelievable production records. Look for the A-B trademark. It means QUALITY in motor control.



CONTACTS CLOSED

Under the same operating conditions a machine with many moving parts is more likely to develop trouble than a simpler machine with fewer moving parts.

The same rule holds true for motor starters. Most starters have complicated linkages, bearings, hinges, pins, and pivots in their mechanisms. Each moving part is a potential troublemaker.

Allen-Bradley Bulletin 709 magnetic starters are SIMPLE—they have ONLY ONE MOVING PART. If you want maintenance free motor controls . . . specify Allen-Bradley. Let us send you the latest A-B information—the A-B Handy Catalog.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

Bulletin 709 starters: Sizes 0 to 4. Sizes 5 to 7 not shown.
Max Ratings: 300 hp, 220v; 600 hp, 440-550v.

ALLEN-BRADLEY

TROUBLE-FREE MOTOR CONTROLS

QUALITY

A-B Quality

5-54-R

Anti-vibration floor pads for heavy industrial equipment are said to eliminate bolting or cementing to floors, at lower installation cost than conventional felt pads. Re-usable pads support pressures to 4000 psi, and are said to resist oils, greases, and alkalis.

According to the manufacturer, it takes a force of more than 1400 lb to move a 2000 lb machine mounted on these pads. The pads consist of layers of cork and sisal fiber, impregnated with Bakelite vinyl resin. A cross-grid waffle surface built into the pads is credited with prevention of movement. Pads have been deflection-tested to 2000 psi, and indicated less than 1% permanent set. Standard pre-cut sizes, up to 32 in. square; can be cut to size.

Bakelite Co, Div Union Carbide & Carbon Co, 260 Madison Ave, New York 16, NY

Miniature precision chrome steel balls are available in 15 sizes, from 0.013780 to 0.088583 in., including 1/32 and 1/16 in. sizes. RMB Miniature Precision Balls are said to have sphericity tolerance of 0.000008 in. max, diameter tolerance per unit being ±0.000012 in.

Balls are usually packed 5000 to 50,000 per vial, with minimum lot size of 100 balls.

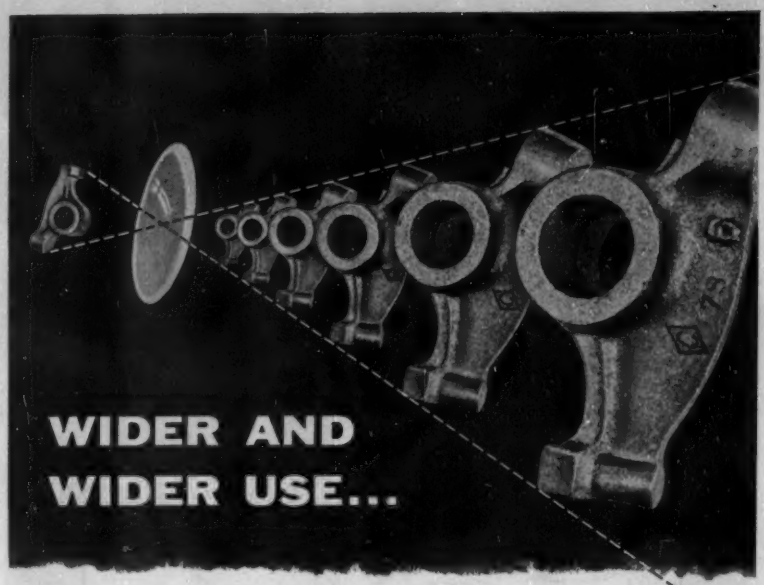
Landis & Gyr, Inc, 45 W 45th St, New York 36, NY

Type "F" thread-cutting screws have been added to the line of fasteners. Type "F" is a self-threading screw which cuts a machine thread as it is used. This design is said to simplify replacement with standard machine screws. Tap-fluted pilot helps screw function as a tap, cutting metal, rather than displacing material.

Indiana Metal Products, Inc, 919 N Michigan Ave, Chicago, Ill

Line of Econ dual-element fuses has been introduced for applications in which long and controlled blowing time is desired. With motors and other circuits where temoprary and harmless overloads are likely to occur, fuses, with balanced dual elements, eliminate unecessary blowouts and resulting downtime losses. Protection extends up to 500% overloads with provision for immediate blowouts on short circuits. Range of sizes is 0 to 600 amp in 250 to 600 v, National Electrical Code Standard in ferrule and knife-blade types.

Economy Fuse & Mfg Co, 2717 N Greenview Ave, Chicago, Ill



PEARLITIC MALLEABLE CASTINGS as engineers see its many advantages

DESIGN ADAPTABILITY: Because of its good fluidity, it can be cast in thin sections and in complicated shapes.

HIGHER STRENGTH: Ultimate strengths range between 60,000 and 90,000 psi; yield strength between 40,000 and 70,000 psi.

EASILY MACHINED: Machinability index (B1112 Steel = 100) ranges between 80 and 90.

WEAR RESISTANCE: Withstands excessive wear under heavy loads at high speeds.

LOCALIZED HARDENING: Sections of the casting can be flame hardened or induction hardened before or after machining.

BEARING PROPERTIES: Good non-seizing properties in metal-to-metal contact.

FINE FINISH: Can be given a very smooth finish where desired.

You will find many applications for Pearlitic Malleable castings – particularly as a replacement for forgings, stampings and weldments – where reduced weight, less machining time, fewer assembly operations and better appearance are important production and sales considerations.

A-9277

NATIONAL MALLEABLE AND STEEL CASTINGS

M&S EST. 1895

COMPANY
Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

OUT OUR WAY
NOW YOU CAN GET BACK TO THE JOB, CHARLEY-- IT WON'T HAPPEN AGAIN! I GOT SOL-SPEEDI-DRI ON THE FLOOR! MEN LIKE YOU ARE THE BACKBONE OF THE SHOP!
THE BULL'S GOT HIS NERVE! I DOUBT THAT CHARLEY'S GOT A BACKBONE LEFT AFTER THE SPILLS HE'S TAKEN!
YEAH--THE SOLID FOOTING WILL BE THE END OF CHARLEY! HE'S TOO OLD TO CHANGE HIS WAYS!
J.R.WILLIAMS
THE OLD PRO
Best value—best seller!
SOL·SPEEDI·DRI
For keeping floors spanking clean — absolutely slip-proof — Sol-Speedi-Dri is way ahead of other industrial oil and grease absorbents. Proof? Industry buys more of it than any similar product. And here's why . . . it spreads fast, covers plenty of ground, "dry-cleans" thoroughly. You can count on consistent quality, too — careful laboratory controls insure that. Why not try it yourself? Send coupon today for free sample.
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WHEN YOU BUY, BE SURE IT'S
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Inquirers in New York, New England, and New Jersey should write to Speedi-Dri Corp. Elsewhere in U.S. to Waverly Petroleum Products Co., 1724 Chestnut St., Phila. 3, Pa. In Canada, G. H. Wood & Company Ltd., Toronto. Branches throughout Canada.
FREE SAMPLE Fill out the coupon and mail today for free sample and literature.
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Address
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AM-5/54

Adjustable-Speed Drive Provides Wide Range

Stepless adjust able-speed drive, Electronic Select-A-Spede, was designed for operation from AC power lines and is available with DC drive motors in standard NEMA frame sizes, ¾ to 15 hp.

Four advantages are claimed: precision speed control; unusually wide speed range, adaptability to variety of optional electrical and mechanical modifications; use of simple reliable electronic circuits.

Speed ranges are 5 to 1, 20 to 1, 50 to 1, or 100 to 1. When the unit is used with optional tachometer feedback equipment regulation will be ± ½%.

Complete unit includes: anode transformer, electronic control panel, pushbutton station, adjustable-speed dc drive motor.

The Louis Allis Co, Milwaukee, Wis

Stellite Alloy Gripping Pads

Gripping pads of Haynes Stellite 98M2 alloy are available for use in automatic lathe chucks. They have excellent resistance to shock and impact and are extremely hard.

In addition to maintenance savings cast alloy pads cost less than material formerly used. Pads come in strip form in convenient 2½-in. lengths which can be cut to any required size.

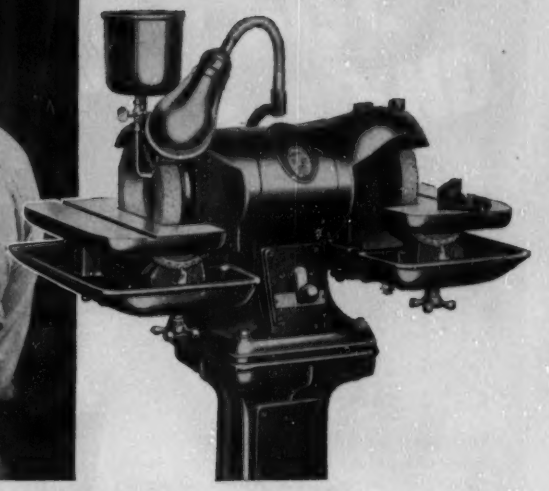
Haynes Stellite Co, Div Union Carbide and Carbon Corp, Kokomo, Ind

Hardenable corrosion resistant alloys produced in cast form with min tensile strength of 180,000 psi, min yield strength of 165,000 psi. Donegal alloy DC-50 contains 0.05% C, 16.5% Cr, 4% Ni, and 4% Cu. Material is said to be suited for cast pumps, valves, and similar wear-subject components. Alloy is machinable in solution-annealed condition, and, when hardened, is said to have ductility and toughness.

Donegal Manufacturing Co, Marietta, Pa

Development of Buna N has wide temperature range (– 40 F to + 325 F), and good oil resistance properties. Tensile strength is 2500 psi, elongation, 350%, and durometer of 70 points. Suited for seals in transmissions, power steering and like applications. Compound 1525.

Goshen Rubber Co, Goshen, Ind



"Our DELTA Saved 20 Times Original Cost... WORTH ITS WEIGHT IN DIAMONDS"

"The savings effected with this 6" DELTA Grinder amount to over $2,000.00 over a nine-year period," reports Mr. Grey, shop foreman at Precision Gear and Machine Company.

Both bench and floor models of the DELTA Carbide Tool Grinder operate *without vibration* because they have dynamically balanced aluminum wheel mountings that are machined *after* assembly. Tilting table (30° toward and 45° away from the wheel) is supported by wide-spread, double trunions.

Precision Gear and Machine Company, Charlotte, N. C., placed a Rockwell-built DELTA Carbide Tool Grinder in their plant nine years ago. Employed to grind carbide cutting tools for eighteen lathes in the machine shop, the DELTA Grinder is equipped with one 6", 120 grit silicon carbide wheel, and 6" diamond wheel with ⅛" side face.

Comments Boyce Grey, shop foreman: "In the nine years since we bought it, our DELTA 6" Grinder has saved us over $2,000.00. The ruggedness and accuracy of the DELTA lets us do the same quality work with 6" diamond wheels that we used to do with far more expensive 10" wheels. This means that the saving in diamond wheels alone has been over twenty times the original cost of the grinder. I guess you could say it's worth its weight in diamonds."

DELTA Carbide Tool Grinders and other rugged, low-cost DELTA Power Tools will perform 90% of the jobs in your shop to the same accuracy standards as special machines costing many times as much.

That's why — throughout industry — there is a growing trend toward accurate, portable, low-cost DELTA Power Tools. You can use them to cut costs, too. Talk to your DELTA Dealer; he's listed in the classified section of your phone book under "TOOLS" or "MACHINERY." Send the coupon for complete data.

Delta Power Tool Div.,
Rockwell Manufacturing Co.
618E North Lexington Avenue,
Pittsburgh 8, Pa.

☐ Please send Delta AB-53 catalog.

☐ Please send name of my nearest Delta Dealer.

Name.....

Company.....Title.....

Address.....

City.....Zone.....State.....

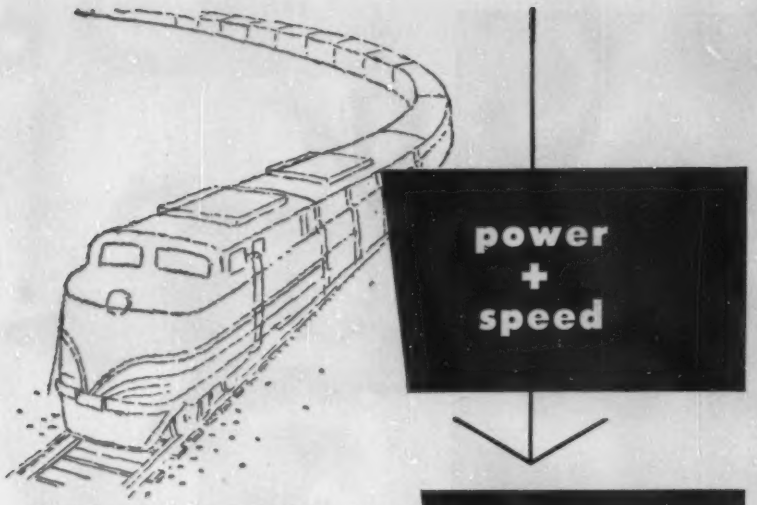
DELTA MILWAUKEE

DELTA QUALITY POWER TOOLS

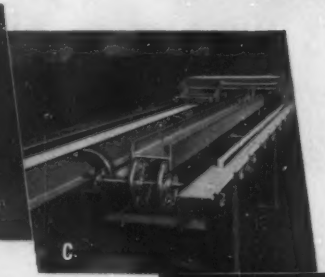
Another Product by **Rockwell**

ROCKWELL

DELTA QUALITY MAKES THE DIFFERENCE



When the schedule calls for prompt delivery of goods, the diesel engineer can "pour on the oil" for reserve power. BEATTY metal fabricating machines have this same type of built-in power reserve for industrial production purposes. One of the machines illustrated can be modified to fit your particular needs. Or, if you prefer, call in our engineers to design and build a machine to your exact requirements.



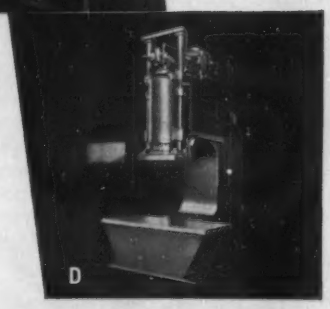
A. BEATTY Horizontal Hydraulic Bull dozer for heavy forming, flanging and bending.

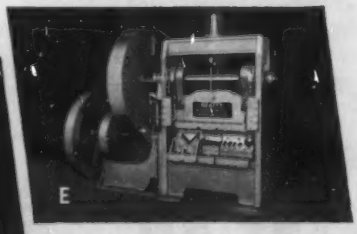
B. BEATTY Guillotine Beam Punch. Punches webs and flanges in "I" beams from 6 to 30 inches.

C. BEATTY Spacing Table handles web and flange punching without roll adjustment.

D. BEATTY Gap Type Press for forming, bending, flanging, pressing. Capacity 250 tons.

E. BEATTY Guillotine Bar Shear for angles, bars, rounds, squares without changing tools.





BEATTY
MACHINE & MFG. CO.
HAMMOND, INDIANA

Air gaging of dovetail root form has been developed so that no special skills are needed for inspection. Gaging spindle is designed to simulate the dovetail root form. Spindle contains a single Balljet and pressure pad arrangement. Pressure pads force the spindle against the angle faces of the dovetail, and the Balljet registers along the bottom, determining the rate of air escapement. Amplification is 2000x, a variation of 0.0001 in. showing as ¼ in. on the Precisionaire scale.

Sheffield Corp, Dayton 1, Ohio

Water Seal

Vike water seal is a soft plastic material for sealing pipe joints, screw threads, and gasket joints on lines handling water, air, ammonia, gas, and steam. It reportedly will not shrink, crumble, or crack, and contains no corrosive substances.

Joints sealed with the material can be broken easily and quickly, according to the manufacturer.

Keystone Lubricating Co, 21st, Clearfield and Lippincott Sts, Philadelphia 32, Pa

Armored group of long tubes twisted together, said to prevent bending without distortion, because tubes are protected by flexible galvanized housing. One tube in each layer has blue color to identify each tube at ends. Intended for use with instruments and process control equipment. Two to 19 tubes, ¼-in. OD, copper or aluminum, normally available from stock, in lengths to 1000 ft. Bulletin available.

Crescent Insulated Wire & Cable Co, Trenton, NJ

Portable Lift Table In Four Sizes

L-2000 Series lift tables are available in 1000, 2000, 4000, and 6000-lb capacities. Lift, hold, and lowering is accomplished through use of two-speed hydraulic foot pump; down stroke permits bench-line positioning.

Full-circle rotation of work-top provides added advantage and locking devices hold top at any degree in cycle without restricting free lift.

Top is fabricated from heavy gage steel; edges are formed and welded with geodetic-design supporting bars on underside. Floor lock and roller bearing wheels are standard equipment.

Lange Lift Co, 4875 North 124th St, Milwaukee 10, Wis

Two point-changes in Allen socket screws have been announced. Smaller point, called the Allenpoint, will replace ASA cup point screws in Allen products. Independent lab tests are said to have established the new point as having greater locking pressures vs removal—torque pressures than current serrated or angled points. Second change is an unthreaded leader point for Allen capscrews, intended to reduce chance of damaged threads, improve line-up in out-of-the-way spots, and protection from damage resulting from dropping or other sharp contact with metal surfaces.

Allen Manufacturing Co, 113 Sheldon St, Hartford, Conn

Variable-speed control for fractional and 1-hp DC motors is said to aid changing speeds of lathes and other machines when several speeds are needed for machining the same piece of work. Control does similar job to changing pulleys, but is quicker, because it acts on the field coil of the motor.

Control is within reach of the operator; to change speeds, a knob is simply turned.

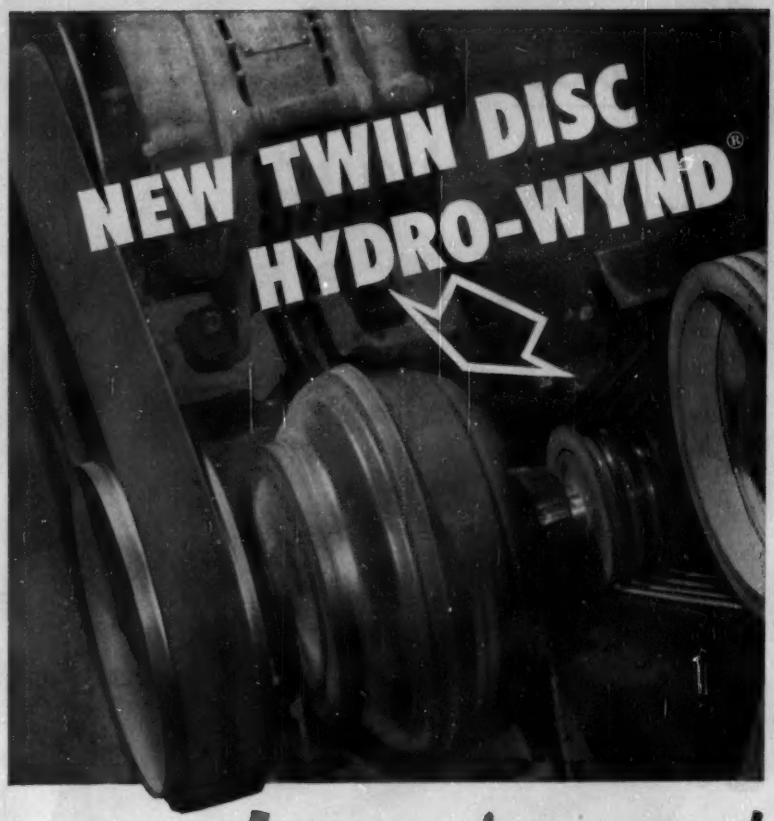
Electro Products Laboratories, Inc, 4501 N Ravenswood Ave, Chicago 40, Ill

Pulverized aluminum in a plastic base is said to metallize surfaces without heat. Kolmetal, applied in two coatings with a 4-hr drying time between applications, provides a plastic-bond aluminum surface which can be polished, ground, drilled, or bent without chipping. Independent testing company is said to report good resistance to atmospheric and sea water corrosion. Recommended by mfr for coating interiors of tanks to prevent contamination and/or protect the tank surface.

Emjay Maintenance Engineers 327 Union Ave, Rutherford, NJ

Tool board provides improved setup system for replacing tools on large transfer and other multi-spindle machines. Complete set of new tools is kept in place, ready to be used. Each tool is identified for size, station, tool number, and adapter size. Standard pre-setting gages aid quick, accurate setting of tools. Duplicating the holding method of the machine, setup gages eliminate in-machine adjustments and making of sample parts to check accuracy of depth settings.

Scully-Jones & Company, 1901 S Rockwell St, Chicago 8, Ill



Automatic control

for winding and tensioning, at low initial cost — without unnecessary bulk or expensive maintenance

Now available in improved design*, and in larger capacity to extend the line, the new Twin Disc Model 12.2 and 8.4 HYDRO-WYND provides a *more effective, more economical answer to automatic winding and tensioning control.*

Extremely compact — easy to install—either the 12.2 or 8.4 HYDRO-WYND combines a fluid coupling with a planetary gear set. Pre-determined tensions—once set—are maintained automatically, regardless of variations in the load demand . . . and with no further adjustments required. The result . . . *higher output per day . . . improved product quality . . .* fewer man hours required.

For complete information on the new HYDRO-WYND, call your Authorized Twin Disc Hydraulic Dealer—or write Dept. DS, Racine, Wisconsin.

*New HYDRO-WYND design features include rearrangement of gear train, better bearing spacing, and new carbon-against-steel spring-loaded seal.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

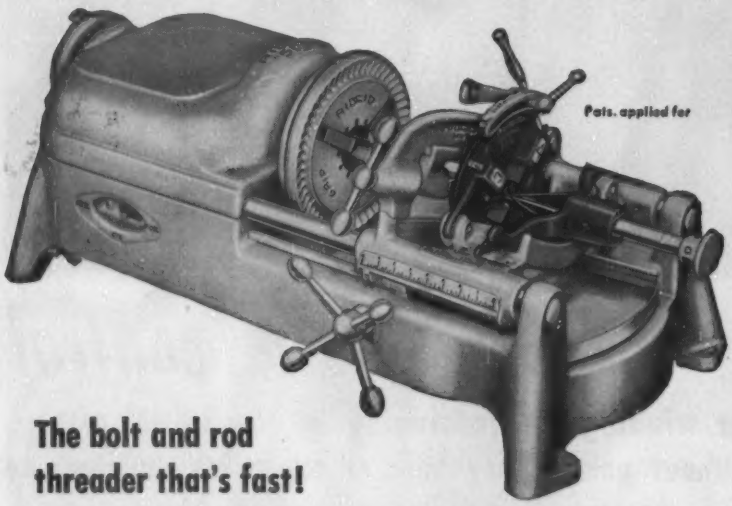
TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Seattle • Tulsa

For Fast Bolt Threading ... it's the New 500A RIDGID with new "SPEED-GRIP" CHUCK

New principle... not just another hammer chuck!



The bolt and rod threader that's fast!

Capacity ¼" to 2" bolts — pipe, too, ⅛" to 2"

You've got to see it and try it to believe it! Only 2 quick-opening die heads—small head for ¼" to 1" bolts, large head for 1¼" to 2" NC, to 1½" NF—to 2½" in 8N, 12N and 16N . . . easy die change, right or left hand threads, easy adjustment to over or under size. Special dies on request. This 500A threads any length bar to 2½" diam., makes studs with RIDGID Nipple Chuck, cuts off 5/16" to 1" rod. Independent operation of tools. Lots of power. New Speed-Grip Chuck guaranteed to hold rod or pipe securely *forward* or *reverse*—motor action makes it tighter. See it, buy it at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

RIDGID
Work-Saver Pipe Tools

Shaft Coupling

Sleevelock shaft coupling is reported to be absolutely self-aligning and to give full shaft contact for entire length of bushings regardless of undersize or oversize shaft diameters. Medart states that it is easy to mount and remove and requires less space to install and operate.

Unit uses basic Sleevelock principle of split bushing and tapered bore. Couplings are now available in six sizes for shafts from ¾ to 6 in. in dia.

The Medart Co, 3535 DeKalb St, St. Louis 18, Mo

Synthetic Rubber For O-Ring Seals

Compound 1120 is for use in O-rings to effect sealing of aviation-type fuels under pressure to 1500 psi over temperature range from −65 to +160F. Sealing is effected by low temperature flexibility of the rubber and its tendency to recover rapidly from shrunken condition. It will not stick, stain or pit metal.

Goshen Rubber Co, Inc, Goshen, Ind

Casting Resin

Stycast TPM is a thermosetting material usable over wide temperature range. The frequencies from 60 to 10^{10} cycles per sec, dielectric constant range is from 2.36 to 2.38, the dissipation factor is below 0.0009. Dielectric strength is 450 volts per mil; volume resistivity is above 10^{13} ohms-cm^3.

Emerson & Cuming, Inc, 869 Washington St, Canton, Mass

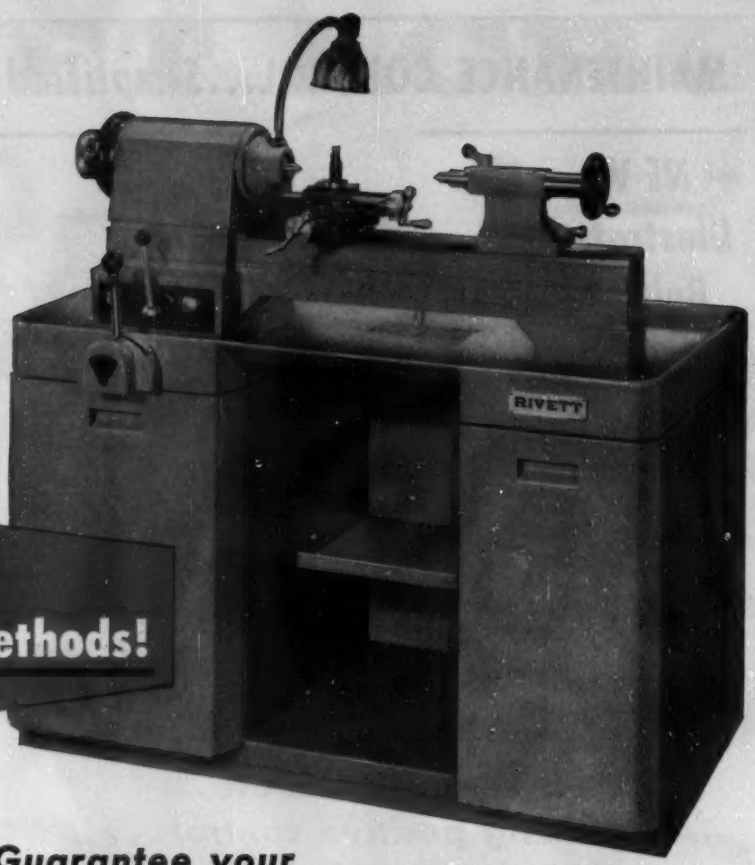
Gravity-Fed Hopper

Union Metal has added a gravity-fed hopper to its Work-O-Matic system of materials handling products. Compact hopper has volume of 34.8 cu.ft. It is 40x46x81 in. Front legs are recessed under work-level tray; tray-end is removable for fast job fiinsh-off. Flow of material is regulated by adjustable control gate.

The Union Metal & Mfg Co, Canton, Ohio

All-purpose Tech-Pen makes permanent markings on any surface. There is no felt tip or other parts to dry up or require replacement. Common solvent removes quick-drying markings. Price, $4 plus ink supply for 25,000 markings.

Mark-Tex Corp, Dept 83, 453 W 17th St, New York 11, NY



Stop using "CUT and TRY" methods!

Guarantee your finish and size with a

RIVETT 918 Steelway Cabinet Lathe

FEATURES for more precision work

- **Instant selection of 90 to 3750 R.P.M. cutting speeds with convenient control and dial indication.**
- **Self-aligning slide rest automatically squares itself with line of centers.**
- **Double bevel steel ways, precision ground, provide positive centering action.**
- **Collets, with spacing of bearings doubled, have greater precision and gripping power.**
- **Lever chuck closer may be furnished with "one motion" control for collet, spindle drive and brake.**

Snug up to a Rivett 918 and with confidence turn, face or bore to your exacting tolerance—thrill with the knowledge that you are duplicating parts within "tenths".

The speed range and tool rigidity combined with the inherent precision of the 918 assures finish and size—perfect for second operations and toolroom work.

Use a lathe consistent in size with the work to be done—save on the initial expense and continue to save with each piece produced with less effort and without rejection.

Write for bulletin 9185L. Proof of what the 918 will do for you is shown in this 20 page book.

RIVETT LATHE & GRINDER, Inc.

Dept. AMR 5, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools.

MAINTENANCE CONTROL...*Simplified*

NEW Illustrated Bulletin on request

Step-by-step procedure providing positive control . . . . with little clerical work

- Maintenance Request and/or Maintenance Order . . . for all maintenance jobs . . . preventive maintenance, repairs, new work, etc.
- Maintenance Supervisor's Order Control . . . progress or follow-up records . . . information for management reports, etc.
- Scheduling and Job Assignment . . . assignment and instructions to Craft chiefs and foremen . . . by Craft chiefs and foremen to workers and crews.
- Job Costs, daily and final.
- Material Control.
- Tool Crib Control.

McCaskey procedures illustrated and described in this NEW folder are readily adaptable to your individual plant requirements.

MAIL COUPON FOR COMPLETE INFORMATION

McCASKEY REGISTER DIVISION
Victor Adding Machine Company
ALLIANCE, OHIO

Please send me complete facts on McCaskey Maintenance Control.

Name .....

Position .....

Company .....

Address .....

AM-5-10-54

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION - INVENTORY
TOOLS - MAINTENANCE - COSTS
THE McCASKEY REGISTER DIV.,
Victor Adding Machine Co.
ALLIANCE, OHIO
Galt, Canada Watford, England

Steel Stacking Rack

Steel rack is engineered to accommodate specified pilot sizes; it is built with flanged legs so that each unit will have complete rigidity when resting on one below. Capacities of individual units vary according to size.

With steel side bars spaced at intervals, contents of each rack are held in position and visible for identification.

Leebaw Mfg Co, 67 Wayne Ave, Youngstown 2, Ohio

Sub-Fractional-hp Speed Reducer

Motorized sub-fractional-horsepower speed reducer is housed in a precision-machined die casting and powered by a shaded-pole motor. Features include: porous bronze bearings and large oil reservoirs; fan for cool operation, nylon high-speed gears; paper layer coils vacuum impregnated; and output speeds to specification.

Horsepower ratings range from 1/500 to 1/75 depending on coil and stack size. Output speeds are available from 1 rpm. Rotation of output shaft can be clockwise or counter clockwise.

Loral Electronics Corp, 794 E 140th St, New York 54, NY

Heavy-duty crane scale Model No. 16-10000DH, has 10,000-lb capacity, with four alloy steel springs to measure load. Readings are direct, in 25-lb increments, on a plastic-covered aluminum dial. A 10% tare adjustment and ball bearing swivel hook permit overall length adjustment. LOA is 36.5 in., and capacity extension is 1.208 in. Weight of scale is 240 lb. Price, $848.

John Chatillon & Sons, 85 Cliff St, New York 38, NY

Timed-relay engine cutoff is connected with fork truck operator's seat, so that whenever operator is out of seat of truck, engine automatically stops after three minutes of idling. Also when operator gets out of seat, brake is automatically applied. Cutoff is said to be especially applicable to diesel fork trucks, where prolonged idling might cause carbon deposits in exhaust system, resulting in shower of sparks when engine is raced after idling.

Yale Materials Handling Div, Yale & Towne Manufacturing Co, Philadelphia, Penna

LO-JET ACRO

Now! the new improved mist cooling system!

the revolutionary new coolant system that keeps cutting tools and work at below room temperatures... prolongs tool life, cuts tool breakage loss... saves money...speeds production...keeps work clean...protects operators and is fireproof!

LO-JET ACRO

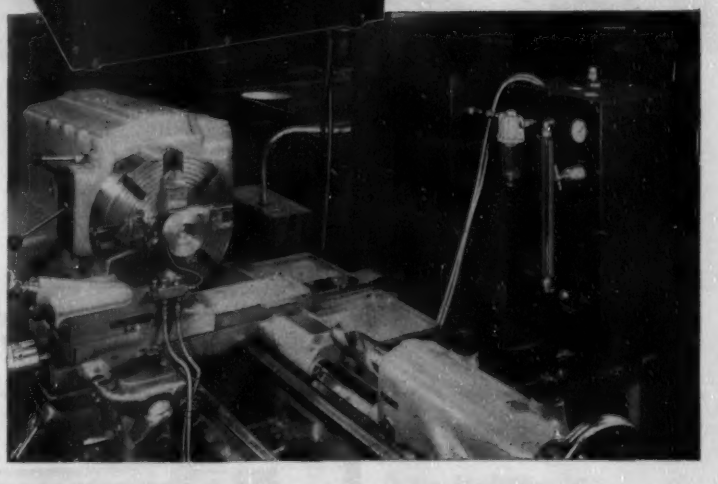
More efficient and adaptable—with separately controlled multiple spray heads. One nozzle can produce a true fog spray while another gives a liquid stream.

Easier to regulate—master panel control now makes every adjustment simpler, much more accurate. Spraymix control, attached by flexible tubes to top of unit, makes for easy positioning and precise, constant spray control.

More compact—all controls, regulators, gauges are **in one place,** at the operator's fingertips.

Smarter looking—a single neat, green wrinkle-finish case houses all mechanisms and controls. The new design eliminates excess piping.

Portable or stationary—mounting permits 'round-the-plant portability, and sturdy bracket mounting also provides for permanent one-location use. Both mountings come with unit.



LO-JET ACRO

there's a Lo-Jet Acro system for every purpose, every machine—write now for details!

AIR CONVERSION RESEARCH CORPORATION
4107 NORTH DAMEN AVENUE
CHICAGO 18, ILLINOIS

Air Conversion Research Corporation
4107 N. Damen Avenue, Chicago 18, Ill. AM-5

Gentlemen: Please send me full information about the new Lo-Jet Acro mist cooling system.

name and title _____
firm _____
address _____
city and zone _____ state _____

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FOR ALL TYPES OF ROUGH AND FINISH BORING

COMPLETELY ENCLOSED MECHANISM KEEPS OUT DUST AND GRIT
COMPACT AND RIGID FOR ROUGH BORING WITHOUT CHATTER; PRECISE AND ACCURATE FOR FINISH BORING
POSITIVE BUILT-IN CENTER STOP FOR MILLING, DRILLING AND REAMING
HARDENED AND GROUND WEARING PARTS FOR LASTING, TROUBLE-FREE PERFORMANCE
ACCURATELY BALANCED FOR THE HIGH SPINDLE SPEEDS OF MODERN BORING MACHINES

Write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

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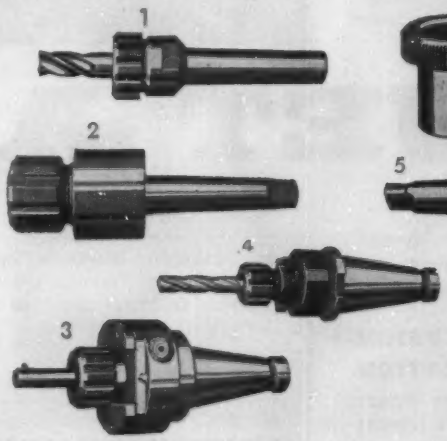
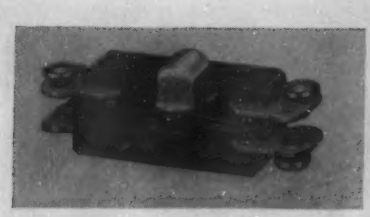
MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER



Snap-Action Switch

Snap-action switch for limit control, safety and interlock applications is available in 24 different models which include 8 re-set switch models, single-pole, single-throw, normally opened or closed, single-pole, double throw, normally opened or closed.

Variety of housings includes splash-proof die cast, general purpose and hermetically sealed cases. Positive snap-action is independent of speed of actuation. Self-aligning springs provide wiping action of contacts. Double break contacts provide two separate circuits and increase capacity of switch

Plastic switch case measures 1¼ in. long, ½ in. wide and ½ in. high. Switch is rated at 10 amps, 125/250 volts ac or 30 volts dc.

Electro-Snap Switch & Mfg Co, 4218-30 W Lake St, Chicago, Ill

Drum Lifters Attached To 2-Part Chain Sling

It is claimed that these drum lifters can be quickly attached to 2-part chain sling and convey 4 drums in one lift. Each drop-forged individual drum lifter has rated safe working load of 10,000 lb. It is equally adaptable on drums where head is in place or removed for holding manufactured items. Opening of drip measures 1¼ in.

Merrill Bros, Arnold Ave, Maspeth, NY

ACCO product

Wilson "ROCKWELL"* Hardness Testers

NOW you can own the BEST for only $550

(less accessories, F.O.B. Bridgeport)

3-JR MODEL

6 Features for Tool Room and Production Testing

This Model 3-JR WILSON "ROCKWELL" Hardness Tester is proving invaluable for tool room use and most production testing. It will pay for itself many times over by eliminating costly complaints from your customers.

These features make for accuracy and long life—

1. Totally enclosed dirt and dustproof "Zero-minder" dial gauge.
2. Enclosed, easy-to-reach, variable speed dash pot.
3. All controls conveniently grouped.
4. Gripsel clamp screw for quick change and proper seating of penetrator.
5. Stainless steel elevating screw.
6. Standardized weights.

No matter what your hardness testing requirements, there is a WILSON "ROCKWELL" Tester to meet it. They are in two types —Regular and Superficial. They are in many styles with accessories for testing flats, rods, rounds and odd shapes. Ask about the WILSON TUKON for micro-indentation testing. Write us for complete information and recommendations.

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ACCO Wilson Mechanical Instrument Division

AMERICAN CHAIN & CABLE

TRADE MARK

230-B Park Avenue, New York 17, N. Y.

"THIS LUBRICANT SAVED US $2,098·16 IN SEVEN MONTHS"

—says THE BROWN COMPANY
Quality Paper Makers of Berlin, N. H.

"During a seven-month period before using LUBRIPLATE No. 130-AA in the bearing of our Kraft Mill Lime Kiln, we used a conventional oil at a cost of $2,134.00. In the seven months that followed, we used LUBRIPLATE No. 130-AA for initial filling and replacement at the cost of $35.84."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose... LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

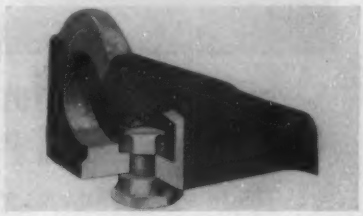
For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

Emergency Lighting

Sentry-Lite equipment provides 10,000 candle-power for emergency lighting; is a compact unit including 18-gage steel case. Case contains 100 amp storage battery which operates for more than 12 hours of continuous service. Special feature is automatic recharging of battery from regular electrical circuit.

Unit is fully adjustable and can be remotely relocated if desired; it weighs 60 lb and the dimensions are 8x13x16 in.

Hobby & Brown Electronic Corp, Rockville Centre, NY



Die-Lifting Tool

Die-lifting tool was designed as solution to problem of safely hoisting heavy dies to melting pots. It attaches firmly to die by means of attachment bolts; as bolts are tightened two hardenend metal spurs bite deeply into die surface and gripping power is increased as lifting force is applied. Hexagon-head attachment bolts are threaded into anchor nuts on die block.

R H Froom & Co, Gardena, Calif

All-State soldering paste, compounded of flux and solder, is applied cold, then heated, any way, to 375 F to seal, join, or tin most common metals, except aluminum. Single-step application, without need of soldering iron; in tubing work, pressure tests to 6500 psi failed to break soldered joints.

All-State Welding Alloys Co, 249-55 Ferris Ave, New York, NY

a 4 in 1 metal working tool!

di-acro* BOX FINGER BRAKE

Accurately, Easily, Quickly Form and Duplicate a Wide Variety of Shapes in Metal as Heavy as 16 Gauge—Widths up to 24" —with Versatile Di-Acro Brakes.

A number of forming jobs can be done with the Di-Acro Box Finger Brake, by simply adjusting or changing the type of mounting bar on the contact surface. Di-Acro Finger Brake is:

- **Box and Pan Brake** — when equipped with a complete set of Box Fingers.
- **Open End Brake**—when Open End Finger is installed in place of Box Fingers.
- **Bar Folder** — when an Acute Angle Bar replaces the Box Finger Bar mounting.
- **Standard Brake** — when a Forming Bar is mounted for heavy operations.

Di-Acro Standard and Radius Brakes are also available. Ten models in all.

*pronounced Die-ack-ro

WANT MORE INFORMATION?

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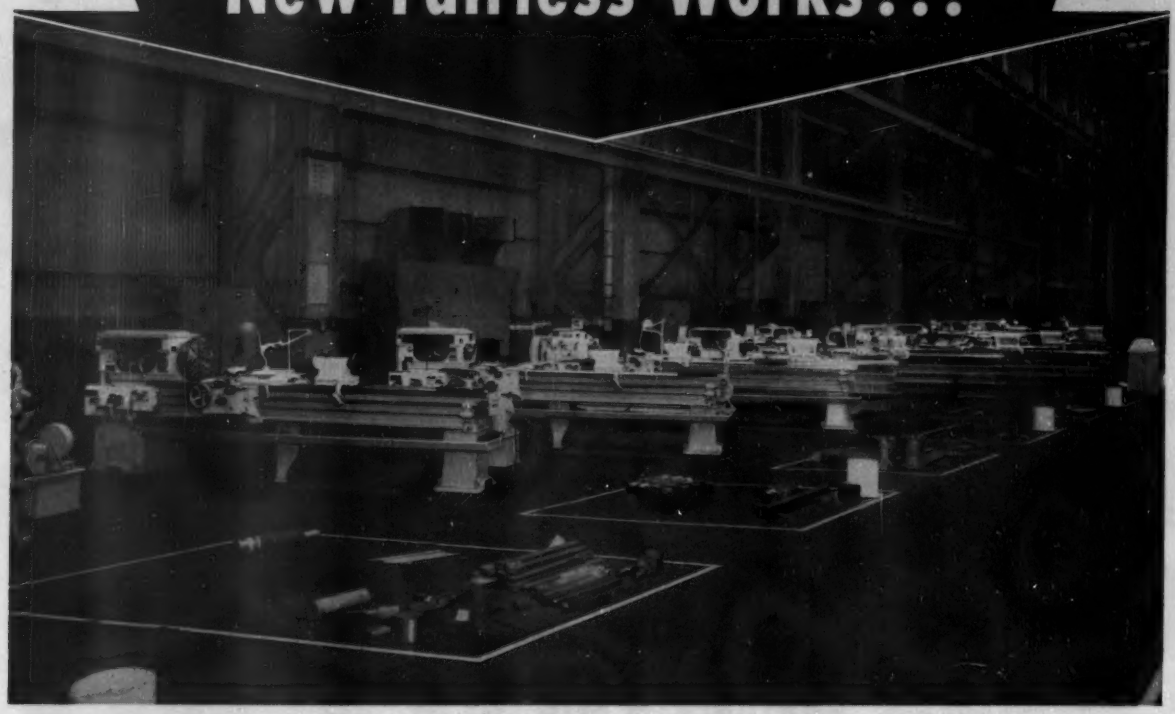
Gives facts on Di-Acro Brakes and also both hand and power operated Di-Acro Benders, Notchers, Punch Presses, Rod Parters, Rollers and Shears. Mail your request today.

Creators of "Die-Less Duplicating"

O'NEIL-IRWIN MFG. CO.
311 Eighth Ave.
Lake City, Minn.

di-acro PRECISION METALWORKING MACHINES

13 LEHMANN Engine Lathes NOW at work in U. S. Steel's New Fairless Works...



The largest integrated steel mill to be built at one time uses LEHMANN Lathes in its modern maintenance shops!

The Fairless Works, built on 3,900 acres and one of the biggest expansion projects built in our time, incorporates the most modern steel mill equipment available. One of the big jobs at Fairless is that of maintenance. Special shops to keep all the equipment used in this 2.2 million ton plant in top running order are an important part of Fairless.

The machine tools, cranes and other equipment necessary for cleaning, machining and repairing the mill operating equipment (which, in fact, make practically all repairs required at Fairless) include 13 Lehmann engine lathes! Some of these lathes are shown in the above photo.

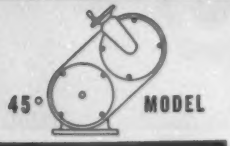
Find out how Lehmann Lathes can bring efficiency, safety and speed to the operations in your plant. Write today for information or catalog — or — send prints for time and money saving recommendation.

LEHMANN
MACHINE COMPANY
GRAND at CHOUTEAU • ST. LOUIS 3, MO.

DIVISION OF NOVO ENGINE CO

REEVES

Fractional HP Motodrive



NEWEST DESIGN FOR VARIABLE SPEED

112 ASSEMBLIES

to choose from— engineered to your exact requirements!

CHECK ALL THESE NEW, REEVES FEATURES

1. New redesigned, more compact drive gives you speeds from 3 to 4660 RPM . . . speed ranges from 10 to 1!
2. New "all-position," 14-turn handwheel gives operator sensitive, minutely-accurate speed control from a position most convenient for the installation!
3. New "all-position" output shaft permits driving in any direction—horizontal or vertical down!
4. New spiral groove lubrication with exclusive overflow outlet provides complete lubrication of all sliding surfaces for trouble-free operation at all times!

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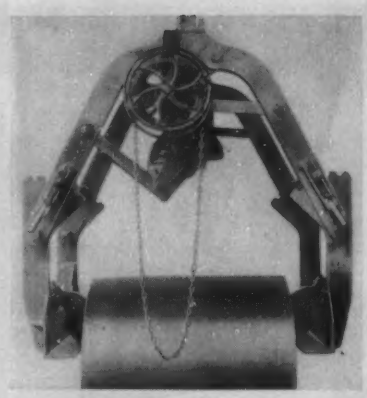
Specify Bulletin A7-M543.



Lifter Handles Both Sheet and Coil Stock

Dual-purpose material-handling tool has 20,000-lb capacity and incorporates hinged-coil-bearing segment at center of each carrying angle. When loose or bundled sheets are to be handled, core bearers are swung 90° upward and locked.

Wide range of stock may be handled because it has an infinite number of opening and closing adjustment of jaws. Adjustment of jaws and carying angles is reportedly made in a few seconds.

Cullen-Friestedt Co, 1300 S Kilbourn Ave, Chicago, Ill

Shear-Blade Protection By Portable Cage

Special work platform, designed for operator protection on paper-shearing machine incorporates foot pedal actuating the shear and coming through expanded steel floor of cage to make it necessary for operator to step into cage to start machine.

Platform cage meets one of varied custom-built work area problems that Ballymore Co solves to speed production by assuring safe working conditions.

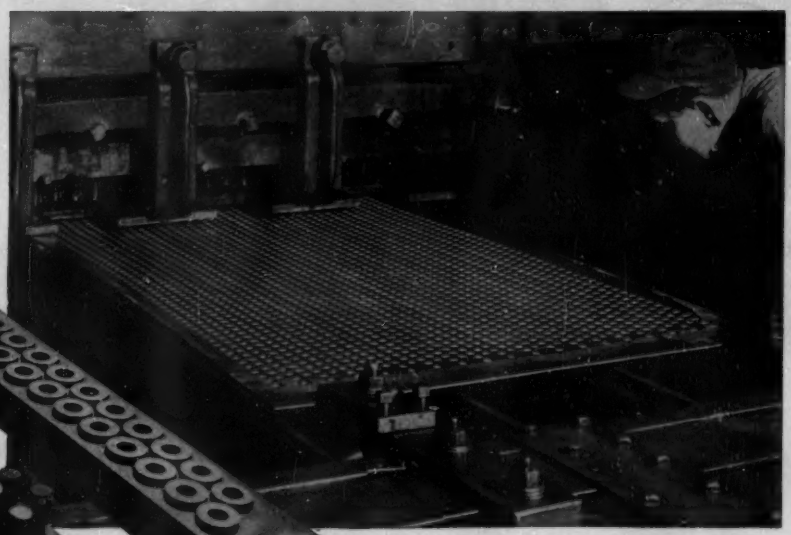
The Ballymore Co, Wayne, Pa

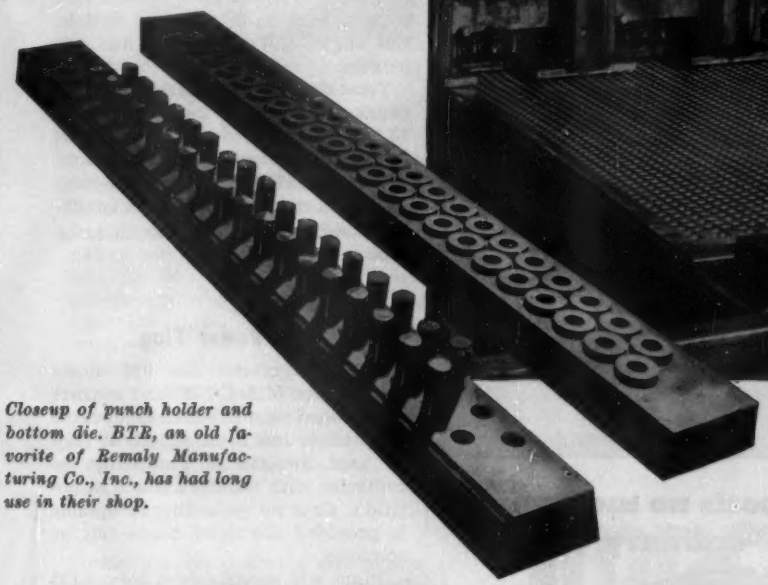
Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BTR Die can simultaneously punch 39 holes 13/16 in. in diameter in 36-in. carbon-steel plate as it stamps screen segment for coal producer.





Closeup of punch holder and bottom die. BTR, an old favorite of Remaly Manufacturing Co., Inc., has had long use in their shop.

Dies made of BTR take big bites in making screens for coal producer

It's interesting to watch some of the operations performed in the shop of the Remaly Manufacturing Co., Inc., Tamaqua, Pa. For example, here's a typical job handled by this 90-year-old firm. They rig up a punch holder and dies in a 900-ton press, feed in 6-gage carbon steel plate, or sometimes stainless, or manganese-bronze. Then, Boom! Boom! Boom! In less time than it takes to tell, they've punched a large screen segment for use in sizing anthracite coal.

What steel do they use for the dies? It's Bethlehem BTR, an old standby with Remaly. One day we asked them what they liked best about BTR for making screen segments. Wear-resistance? Shock-resistance? Low distortion? Good machinability? Fast, easy heat-treatment?

"It's hard to put a finger on any one of those points and say it's best," answered Bill Yost, one of the heads of the firm. "In our shop, we like BTR on all counts. It stands up well. In fact, I can't remember ever having trouble with it."

BTR (Bethlehem Tool Room) is our general purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. Its outstanding characteristic is its safe-hardening property. It has the happy combination of abrasion-resistance and toughness, making it an ideal steel for tool-and-die applications where long wear is essential.

Your nearest Bethlehem tool steel distributor has a good stock of BTR on hand and is at your service. Give him a call at your first opportunity.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Don't Punch All the Way Through

The tool life of punches can be greatly improved by proper control of the stroke of the punch. It is not necessary for a punch to go completely through the hole being punched, for when it does, rapid wear occurs. The wear increases clearance, which in turn increases the load necessary for punching and also results in burred edges.

When a punch has penetrated part way through the stock, "snapping" occurs and the "button" pops out. How far the punch penetrates before snapping takes place depends upon the material being punched and the thickness of the stock. Generally, the softer the material the greater the penetration required. Conversely, a hard or brittle material requires less penetration.

Penetration on soft, thin stock may be as high as 90 pct of the stock thickness, and on hard, thick stock, as low as 40 pct. The less penetration required to bring out the button, the better. What the penetration should be must be determined empirically on each job. Control of punch penetration by adjusting the press stroke means decreased punch-wear, better quality parts and increased tool life.

"- - - and then one day I made my fortune by switching the shop to Columbia SUPERDIE."

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

WILTON VISES

Specified by America's greatest AUTOMOTIVE AND AIRCRAFT INDUSTRIES

Proven best for ruggedness and strength in America's OIL FIELDS

WILTON VISES

WILTON

THE FINEST NAME IN VISES

costs no more than ordinary vises!

All Wilton's have these *exclusive* features:

- Straight line pull for greater strength.
- Finest malleable iron construction.
- Sealed housing protects spindle from grime and grit.

WILTON TOOL MFG. CO.

925 WRIGHTWOOD AVENUE • CHICAGO 14, ILLINOIS

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Safety and Time-Saving With Phenolic Wiring Duct

Wiring duct is composed of canvas weave, laminated phenolic which is highly moisture-resistant, rigid and strong, but can readily be cut with tin snips. Side angles are furnished in 2- and 3-in. heights; covers and clips in 1-, 1½-, 2- and 3-in. switch; side angles and covers in 3- and 4-ft lengths.

Time studies reportedly show that channel wiring cuts labor time from 40 to 70% over conventional methods of panelboard wiring. Wires are concealed for safety and neater appearance, and can be cut to exact length.

Stahlin Bros Fibre Works, Belding, Mich

Three-Bladed Power Plug

Armored connector No. 920 meets specification MIL-C-3767 and consists of standard plug to which removable third blade has been added. It may be used directly in grounding receptacles with the third blade in position. Or if no grounding receptacle is provided the third blade can be removed.

Plugs will accept cables from 0.125 to 0.450 in. in dia. Bodies are molded of high-impact, glass filled alkyd resin and all screws are staked in place.

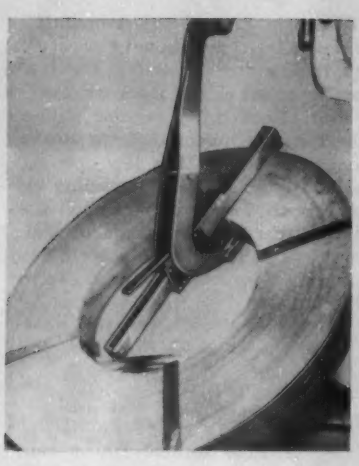
Automatic & Precision Mfg Co, 252 Hawthorne Ave, Yonkers 5, NY

Magnetic Recovery Tool

Eriez has constructed a 4½-in. magnet to be used as a recovery tool. It is a self-contained instrument using permanent Alnico 5 magnet contained in 1-in. non-magnetic stainless steel tube. Mild-steel tapered plug. is on attracting end of tube to provide sinking weight while on the other end is a captive ⅛-in. standard pipe nipple drilled with 3/16-in. hole.

In steel pipes the magnetic attraction of the tool to the walls of the pipe is prevented by incorporating two removable neoprene rings which slip around recovery tube. Cost of the tool is $11.95.

Eriez Mfg Co, Eriez, Pa



Dixon Coil Grab For Limited Head Room

New 1,000-lb capacity coil grab with 5-to-1 safety factor, is designed for narrow coils up to 8 in. in width. It is semiautomatic and operation requires one man. Wedges are moved into position by means of ratchet mechanism. As grab wedge works from ID of coil, little headroom is required.

Tools are primarly for use with crane or hoist, but fork lift trucks can be used to transport coils. Model B10 has rust-proof Parkerized finish.

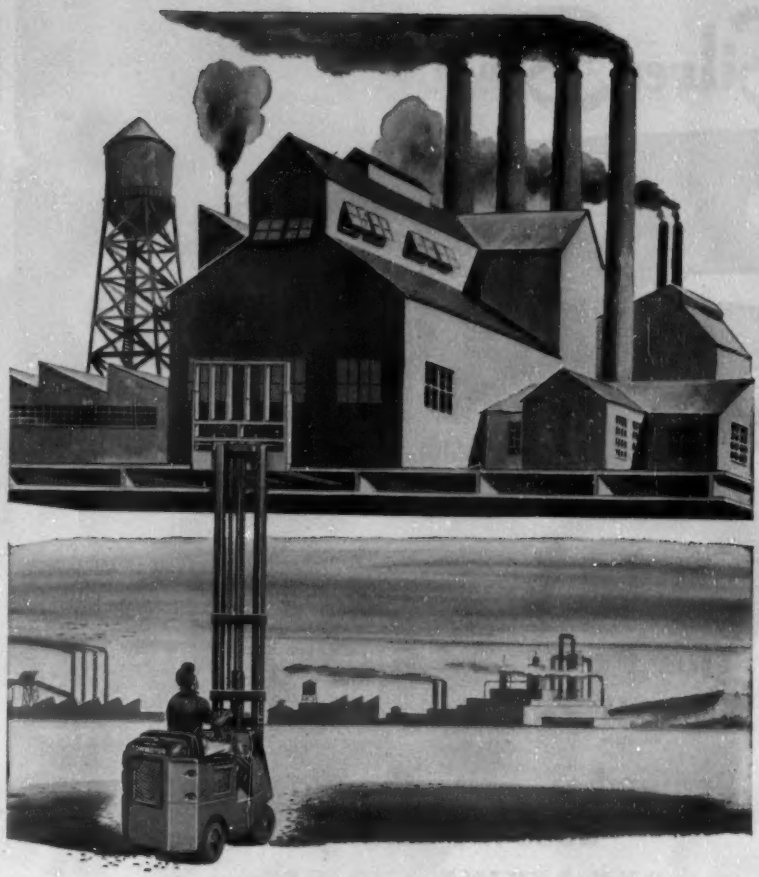
Dixon Automatic Tool Inc, 2300 - 23rd Ave, Rockford, Ill

Special electrical drying and heater units have been designed primarily for instruments, aviation products, batteries, process control, and general industrial use. Resistance wire is enclosed in fiberglas, teflon, silicone, rubber, and additional protective metal braid. Heaters can operate at subzero temps, and at 400 F and over without disintegration. In most cases they are flexible and thin-sectioned for a daptability in small spaces.

Haddam Mfg Co, Route 9, Haddam, Conn

Sod-R-Braze air-acetylene apparatus has been designed for quick maintenance and repair work on all types of jobs where fusion welding is not essential. Outfit consists of torch, tips, hose, and adjustable regulator. Used with NCG's 40-cu-ft acetylene cylinder, weighing approximately 32 lb, it is easily portable. Can be used for brazing with silver or copper alloys, soldering and heating.

National Cylinder Gas Co, 840 North Michigan Ave, Chicago 11, Ill



Impossible?

The impossible is obvious . . . but perhaps you are missing some of the many possible TOWMOTOR applications around your plant. Besides receiving, warehousing, and shipping, TOWMOTORS can also save time, labor, and money on maintenance jobs. Lifting workmen to high walls and ceilings. Moving heavy machinery when and where needed most. With dozens of special attachments, TOWMOTORS speed production—change unwieldy dies, shake out annealed castings, pour chemicals into vats . . . handle every conceivable shape and material! Let us show you how much *more* TOWMOTOR can do and save for *you* . . . send for "Towmotor Portfolio for Executives." TOWMOTOR CORPORATION, Div. 5605, 1226 East 152nd St., Cleveland 10, Ohio.

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FORK LIFT TRUCKS and TRACTORS
Since 1919

TOWMOTOR ENGINEERED FOR QUALITY PERFORMANCE

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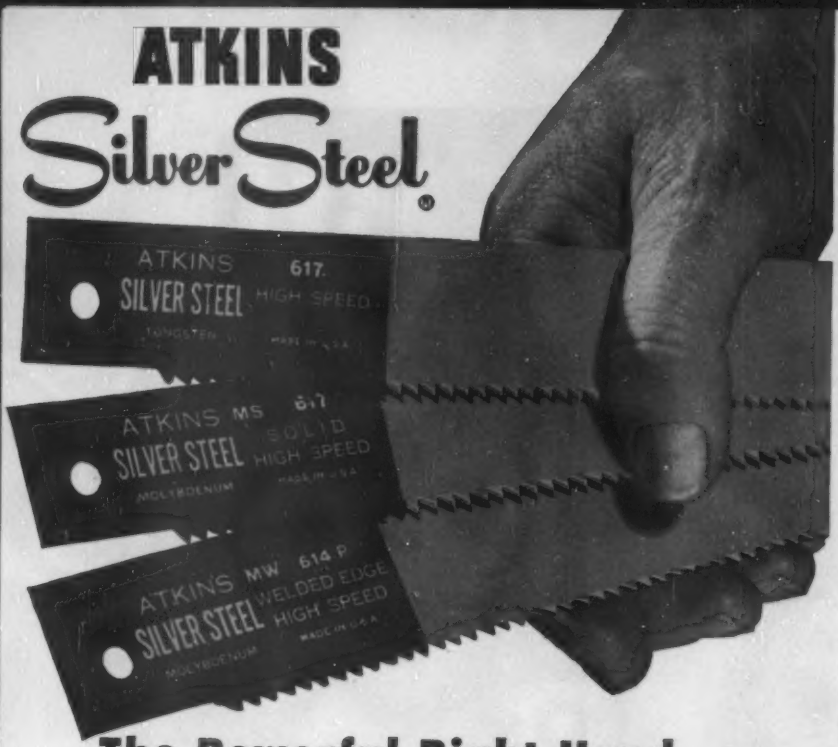
Silver Steel



The Powerful Right Hand for All Your Metal Cutting!

Remember . . . it's the blade that does the cutting!

BUY ATKINS AND GET:

- The Right Alloy
- The Right Cutting Edge
- Consistent Low-Cost Operation
- Maximum Production
- Minimum Down Time

SILVER STEEL TUNGSTEN—the choice for the toughest jobs, for fast, efficient cutting of highly abrasive materials.

SILVER STEEL SOLID MOLYBDENUM—the economical all-round blade to cut both ferrous and non-ferrous metals.

SILVER STEEL WELDED EDGE MOLYBDENUM—it's shatterproof for top production and extra life in general purpose cutting.

Make it Atkins Silver Steel for hand cutting too!

New improvements in Atkins metallurgy and manufacturing make these *Silver Steel* hand blades ideal for the most exact cutting. They're High-Speed Tungsten and High-Speed Molybdenum, either All-Hard or Flexible Back.

ATKINS SilverSteel SAWS

ATKINS

B-W

ATKINS SAW DIVISION · BORG-WARNER CORPORATION
INDIANAPOLIS 9, INDIANA

WiltOmatic line of power-operated vises uses the conventional vise screw and handle for presetting the jaw opening to the size of the work. Power unit, attached to a regular Wilton vise, has an adjustable power stroke from 0 to ¾ in. Max jaw opening varies from 3 to 9 in. depending on size of vise. Power stroke is activated by either a foot or hand control. Complete units are available in 2½ through 6-in. sizes, priced from $91.19 to $238.

Wilton Tool Mfg Co, 925-941 Wrightwood Ave, Chicago 14, Ill

Steel-Clad Floors

Industrial floor termed Ancor consists of heavy-gage rolled steel plates to provide hard abrasion-resistant surface. The company states that buckling, curling, cracking, and noise is completely eliminated. Each plate embedded in concrete is held in place with 25 surface anchors in each square foot and 28 edge anchors to prevent movement.

Steelclad floors are easily installed over sound wood floors, new or old concrete, or in place of worn brick or wood blocks, faulty metal plates or sheets.

Flash-Stone Co, Inc, 3723 Pulaski Ave, Philadelphia 40, Pa

Pressurized Aerosol penetrating oil for loosening rusted bolts, cleaning off grease and oil, and similar uses, is available in 12-oz can, priced at $2.35. AP Kroil bulletin describes Kano Kroil.

Kano Laboratories, 1000 S Thompson Lane, Nashville 11, Tenn

Inert-gas consumable-electrode bare welding wire is available in coiled form in 0.045, 1/16, and 3/32 in. diameters, on reels, for the Aircomatic process, and on rims, for the Linde Sigma process. Ampco-Trode 10, 160, and 200 bare wire is also available in 22-in. ID coils for submerged-arc and automatic inert-gas tungsten-arc processes.

Ampco Metal, Inc, 1745 S Thirty-Eight St, Milwaukee 46, Wis

HSS twist drills are being offered packaged in plastic bags having individual pockets for each drill, each pocket marked with its drill size. Four different sets, jobber-length drills, by 1/32nds and 1/64ths to ¼ and ½ in. Also in machinist-lengths, 10% cheaper than jobber-length.

Hayden Twist Drill Co, 8626 Lyndon Ave, Detroit 38, Mich

"We saved them time...increased tool life with one cutting oil!"

A large southern machine tool company and contract shop recently installed a 2½-inch, 5-spindle automatic screw machine on which different metals are machined every day.

Mr. Horace Lane, a Sinclair Industrial Lubrication Engineer, was called in to recommend a cutting oil that would perform equally well on brass, aluminum and steel. Mr. Lane reports, "It would have been impractical to drain 150 gallons of oil for each different contract job, so this machine needed a multi-purpose cutting oil – one containing both sulfur and lard for their wetting and anti-weld properties.

"From my past experience," Mr. Lane continues, "I recommended Sinclair SUPER WILKUT® which contains a balanced proportion of sulfur and fatty oil, in non-corrosive form, plus good heat-transfer characteristics. *Results were highly satisfactory!* Sinclair SUPER WILKUT saved time and money by eliminating frequent oil drains. It also helped to maintain close tolerances and prolonged tool life."

Why not let a Sinclair Lubrication Engineer help solve *your* lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N.Y.

SINCLAIR CUTTING OILS

SHELDON
CHICAGO U. S. A.

More will be *profit* with a Sheldon

It actually costs less to do most turning jobs on a Sheldon Precision Lathe. Machine-tool investment is cut to a fraction. Power cost is materially reduced. Less experienced operators can operate Sheldons safely and efficiently. Even cost-loadings for plant—floor space, heat and light are lower because two Sheldons can often operate in the space occupied by one large lathe.

On most "everyday" jobs a Sheldon will actually turn out more pieces per hour too. With double V-belts to the spindle Sheldon lathes deliver enough power to take a healthy bite in direct drive, at really high speeds. Sheldon's "Zero Precision" Taper Roller Bearings permit work to the closest tolerances. Very seldom if ever are such extremely accurate bearings used in other lathes.

You will actually keep more as profit if you use Sheldon Lathes wherever possible.

Write for Catalog

SHELDON MACHINE CO., INC. 4234 N. Knox Ave. Chicago 41, Illinois

Electronic Digital Computer Available

General purpose mathematical machine, Consolidated 203 Digital Computer, is not limited to any specific field of activity but adaptable to any problem reducible to numerical terms. A proven central component of computation systems assembled to specific needs of customer, computer has solved problems ranging from aircraft flutter studies and boiler design to interest-rate calculations.

Instrument uses binary-coded decimal system in which four binary digits form each decimal digit. Four binary digits are operated upon in parallel, while each successive decimal digit is handled serially. Additions, subtractions, logical shifts, and transfers are performed at average rate of 500 per sec; multiplications are accomplished at 120 per sec, and divisions are 85 per sec. These typical operational rates include obtaining 10-decimal-digit words from quick-access portion of memory.

Output is flexible. Data may be read to standard punched cards tabulated in alpha-numeric form by Flexowriter electric typewriter, or punched into paper tape. Last may be used for later tabulation or reinsertion into computer through photoelectric reader.

Consolidated Engineering Corp, 300 N Sierra Madre Villa, Pasadena, Calif

Lubricant is especially designed for open gears, sprockets, chains, leaky gear boxes, and other similar applications, where it is necessary to have a sticky substance which will not drip off or spray off rapidly moving surfaces. Kotall, a heavy fluid, is poured onto the surface to be lubricated, spreading to form a film.

Tower Oil Co, Chicago, Ill

Live Bushings for Piloting Applications on Boring Mills

Roller bearing live bushings replace bronze bearings in column supports of boring mills to give greater rigidity with corresponding increases in precision. Units permit use of carbide tools to full capacity of heavier cuts at higher speeds.

Jergens states that the liners of these bushings rotate with the bars to prevent scoring and wearing of expensive boring bars. Utilizing two sets of sealed, adjustable, precision-tapered roller bearings, bushings are made to maximum bar capacity.

J G Jergens Co, 11106 Avon Ave, Cleveland, Ohio

Now... a 30-inch Contour Projector with Kodak's Advanced Optical Design

Ever since the first Kodak Contour Projector was built six years ago, engineers have asked for a 30-inch model with the same advanced optical refinements.

Now the new Kodak Contour Projector, Model 30, answers industry's need for a precision measuring instrument to handle large parts quickly, conveniently.

If yours is one of the hundreds of companies already using optical gaging methods, you'll want to learn how the new "Model 30" can boost efficiency in present operations. If you are not making use of optical gaging, you'll want to learn how the Model 30 makes its use far easier and more economical than ever before.

For complete details of the Kodak Contour Projector, Model 30, write to:

EASTMAN KODAK COMPANY
Special Products Sales Division
Rochester 4, N.Y.

the KODAK CONTOUR PROJECTOR

Check these outstanding features of the Kodak Contour Projector, Model 30:

Self-Contained Normal Surface Illuminator. Built-in 1500-watt light source provides maximum surface illumination to inspect surface details, recesses, and blind holes.

Kodak Magnification Selector. Lens turret provides choice of magnifications at the flick of a switch.

Par-Focalized Kodak Projection Ektar Lenses. Six specially designed lenses provide magnifications from 10× to 100×. No refocusing necessary when you change magnification.

Uniform Work Area At All Magnifications. Kodak's unique relay lens system gives you a uniform 8-inch clearance between the part and optical system regardless of magnification selected.

Bright Screen Image. The 500-watt light source for shadow projection provides sharp, easy-to-read screen image across the full 30-inch diameter.

Built-In Helix Table. Worktable rotates 15° off center for compounding helix angles.

Direct-Reading Rotary Screen. Graduated to 2′ of arc. Angular measurement is read directly from a dial without vernier. Dial may be zeroed, eliminating lost time in aligning protractor ring.

64-Sq.-In. Measuring Area. Eight-inch horizontal and eight-inch vertical table provides an area of 64 square inches for direct measurement. Worktable measures 26″ x 8″.

Uni-Strut Assembly. Provides maximum rigidity. Projection lenses and mirrors sturdily mounted on a single member.

Compact Design. Floor space required for the Kodak Contour Projector, Model 30, is approximately 1/5 less than that required for other 30-inch projectors.

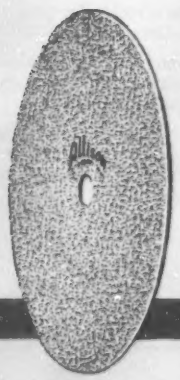
Kodak

No need to hold back any longer...

Adequate Titanium Supply Assured by Aircraft Production Resources Agency
January, 1954, Bulletin:
"It is evident that there will be more assurance of an adequate supply to meet most planned production programs in 1954."

Titanium
IS RARIN' TO GO!

. . . and the cutting of Titanium is no longer a problem, either. Allison abrasive cutting wheels can speed your company on its way to finding new uses for this wonder metal. Tests prove that abrasive cutting is *the only efficient and economical method* for cutting Titanium, as well as many of the tough "new" high-temperature resistant alloys.



The cutting of Titanium with Allison abrasive wheels is comparable in speed, quality and economy with that of cutting most grades of steel.

Tough Cut-Off Jobs Are Easy . . . with Allison.

2AL54

The *best* way to cut many materials . . . the *only* way to cut some.

Allison ABRASIVE CUTTING WHEELS

THE ALLISON CO., 256 ISLAND BROOK AVENUE, BRIDGEPORT 8, CONN.

Air and Hydraulic Cylinders From Standard Stock

In addition to its line of custom-built cylinders, Miller is offering stock cylinders in several hundred combinations of bore, stroke, and mounting. They have solid steel heads, caps and mountings, hard chrome-plated piston rods, dirt wiper seals, and leakproof piston and rod seals.

Air cylinders are rated for 200 psi, hydraulic cylinders for 2000 psi. Mounting attachments are available as desired.

Non-cushioned types are available with strokes from 2 to 11 in.; cushioned types in strokes from 3 to 13 in.

Miller Motor Co, 2040 N Hawthorne Ave, Melrose Park, Ill

Dust Collectors Have Extra-Large Drawers

Torit Series 602A three-cabinet dust collectors are equipped with drawers having 7-cu-ft capacity. Air capacities range from 300 to 11 cfm.

Largest unit is powered by 3-hp motor to develop 1100 cfm with one 6-in. inlet. It is intended for heavy, continuous service with several small grinders and polishers.

Two models, 80 and 81, are provided for lighter service. First is powered with 1-hp motor and develops 300 cfm from each of two 4-in. inlets; 81 is powered with 1½-hp motor and develops from 465 to 1000 cfm.

Rorit Mfg Co, 280 Walnut St, St Paul 2, Minn

Diamond-studded nylon belts are designed to overcome problems of polishing carbide tube and rod drawing dies. According to the manufacturer, as many as 460 dies have been polished with one belt, with finishes to ½ mu-in. rms. Belts can be washed in warm soapy water without affecting bond, and nylon resists damage from almost any type of coolant. Five grades are available, from 100-mesh sieve to 1-5 microns. Widths range from ⅛ to ⅜ in., for standard 75 or 104 in. continuous belts.

Hartford Special Machinery Co, Hartford 12, Conn

Covered or bare filler rods, 36 in. long, of Ampco 10, 160, 200, 250, and 300, are available for carbon arc and inert-gas tungsten-arc welding. Not recommended for oxy-acetylene welding.

Ampco Metal, Inc, 1745 S Thirty-Eight St, Milwaukee 46, Wis

balanced △ design

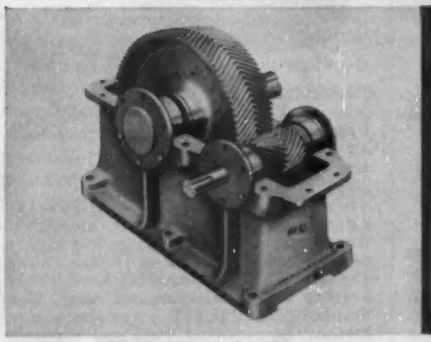
BALANCED DESIGN . . . adds to the life of Philadelphia Herringbone Gears and Speed Reducers. In addition to the Sykes continuous tooth, Philadelphia also manufactures Staggered or Separated tooth gears of the Herringbone type in sizes up to 150 inches diameter. For heavy duty industrial drives, the Herringbone Gear provides maximum efficiency and economy.

EFFICIENT, because overlapping tooth design provides smooth, quiet power transmission with almost no power loss between gears.

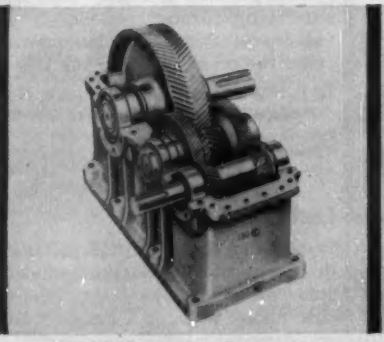
ECONOMICAL, because the Herringbone tooth design has greater inherent strength, thus permitting the use of gears of less dimensions than might otherwise be employed. Also, the balanced axial thrust forces eliminate the necessity of heavy bearings to absorb these forces.

The balanced design of Philadelphia Herringbone Reducers is carried one step further in completely balanced gear units. Philadelphia reducers, illustrated below, show how the Herringbone and opposed helical gears are nestled within one another,—thus providing a wide, stable housing with balanced gear and bearing loads.

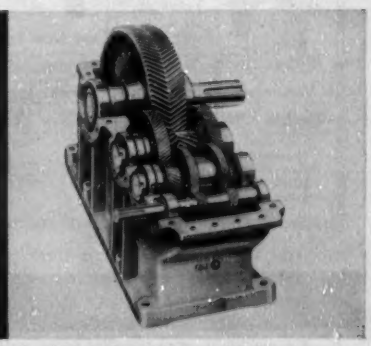
Write for Catalogue H-49.



Single Reduction Type



Double Reduction Type



Triple Reduction Type

PHILADELPHIA GEAR WORKS, INC.

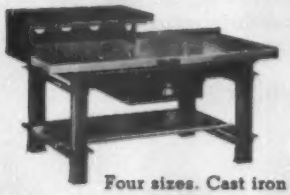
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears & Speed Reducers

LimiTorque Valve Controls

For layout, inspection, checking, lapping, assembly and welding operations . . . depend on the accuracy and stability of Challenge Precision Equipment. Mail coupon for information on Layout Surface Plates . . . Clamp Edge Layout Plates . . . Reading Tables . . . Lapping Plates . . . Welding Tables . . . Surface Plates . . . Bench Plates . . . Surface Plate Equipment.

Challenge Work Benches . . .



Four sizes. Cast iron top, two inches thick. Welded steel supports, tool box shelf, steel drawer with lock. *Challenge Utility Benches* — low cost.

Challenge

TRADE-MARK ®

THE CHALLENGE MACHINERY CO
GRAND HAVEN, MICHIGAN

Send details as checked below:

☐ Layout Surface Plates ☐ Work Benches
☐ Surface Plate Equip. ☐ Utility Bench
☐ General Catalog ☐ Welding Tables

Name_____

Full Address_____

Silver Dutrax Cable

Installation of non-metallic-sheathed cable has reportedly been made easier by smoother surface on Anaconda's Silver DUTRAX. Tests are reported to show that DUTRAX can be pulled through joists with half the effort necessary to pull ordinary non-metallic-sheathed cable.

Anaconda states that the cable will not become sticky. Both high and low temperature characteristics have been thoroughly tested.

Anaconda Wire & Cable Co, Hastings-on-Hudson, NY

Sound Absorbing Units Are 24 in. Long

Sonosorbers are 24 in. long and hung on 2, 4, 6, or 8-ft centers as desired. Units have inner cores encased in perforated-stucco embossed aluminum and weigh about 2½ lb each. Said to be especially suited for noisy industrial and commercial locations where ordinary acoustical treatment is not applicable or adequate. Units are non-flammable and do not necessitate moving of sprinklers, lighting fixtures, or other existing equipment.

Sonosorber Corp, 21 South 16th St, East Orange, NJ

Hydro-pneumatic force adjustment device, applied to double-action press, acts as safety overload protector, and allows blankholder pressure to be adjusted independently at all four corners. Avoids problems accompanying mechanical adjustment for variations in workpiece thickness. Pressure at each corner of blankholder can be determined and then duplicated at a later time without "setup" procedures. Safety provided against double blanks, which cause the press to stop when this device is attached.

Federal Machine & Welder Co, Warren, Ohio

Centrifugal Pump

Dynapump is a centrifugal pump driven by rotating magnetic field instead of usual drive shaft. This feature makes possible a low-cost, leakproof motor and pump unit which eliminates the need for a shaft seal. It is now available in fractional horsepower sizes; standard units are of stainless steel for pumping most fluids. Other materials for special purpose usage also are available.

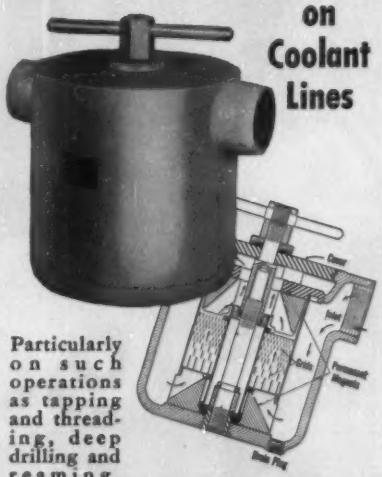
The Fostoria Pressed Steel Corp, Fostoria, Ohio

If you don't think these can mar a finish or dull a tool . . .

you'll notice the difference with . . .

FERROFILTER®

Magnetic Separators on Coolant Lines



Particularly on such operations as tapping and threading, deep drilling and reaming, trepanning and gear cutting, it is highly essential to remove from coolant these abrasive ferrous particles which mar finishes and accelerate tool wear. The Frantz FERROFILTER gives you a sure method of reducing tool and machine maintenance, improving finishes and prolonging useful coolant life. For complete information . . .

Send for BULLETIN PM-57

S. G. FRANTZ CO., Inc.

P. O. Box 1138 Trenton 6, N. J.

Soldering Tool

Solder-Quik is reported to be safe, handy, and quick. Operating voltages at tip only 3½ to 12½ volts; no heat is generated except when in contact with the work. Completely enclosed transformer is protected with easily replaceable 4-amp fuse.

Unit is light in weight and twin carbon electrodes establish instant soldering contact at right spot with no separate connection needed. Work is said to be heated instantly to soldering temperature. Choice of six soldering heats is provided.

Specifications include: power consumption, 5 to 250 watts; over-all length of soldering tube, 8¾ in.; clearance needed for tip, ½ in.; length of carbon electrodes, 2 in.; diameter of electrodes, 5/32 in.

Stark Manufacturing Co, PO Box 489, Tuscaloosa, Ala

Cemented carbide inserts brazed in the power-driven socket heads of tool wrenches are said to minimize production interruptions due to wrench changing on production lines. Users report minimum socket-head life fifteen times over conventional steel sockets with lower unit-tightening costs. Sockets, which can be used on all types of power or hand tools, are available in ¼-in.-sq drive with hexagon openings from ¼ to 7/16 in., and ⅜-in.-sq drive with openings from 5/16 to 1/2 in.

Carboloy Dept, General Electric Co, Detroit, Mich

Thread Compound Protects Against Welding Action

High-temperature thread compound protects against welding action of threaded connections subjected to prolonged exposure to extreme heat. Known as "Thred-Gard," it is said to eliminate seizing and galling at operating temperatures to 1200 F.

Compound is non-hardening and acts as lubricant. By reducing wrench torque it allows fittings to be drawn to a greater degree of tightness. It is available in ½-pint, 1-pint, and 1-quart size cans.

Crane Packing Co, Dept AMN, 1800 Cuyler Ave, Chicago 13, Ill

Pencil die grinder has 40,000 rpm spindle, weighs 13 oz, is 5¾ in. long, and has ⅛- or ¼-in. collet. Three-blade air motor is controlled by sliding sleeve throttle. Designed for use with small burs and mounted points.

Rotor Tool Co, 26300 Lakeland Blvd, Cleveland 23, Ohio

NELCO CARBIDE TIPPED SLAB MILLS—

SET NEW PRODUCTION *Records!*

Machine Army Automatic Rifle Receivers in ⅓th the time . . . to better finishes . . . with 30 times more pieces per grind than conventional cutters!

An amazing story, but TRUE! Working on tough, scaly Perlitic Malleable iron castings, Nelco carbide tipped slab mills took a healthy .100 - .125 bite—a full 3½ inches wide—on a 3 horsepower machine at the incredible feed of 11½ inches per minute! Not only did the Nelco slab mills surpass conventional cutters in speed, *but produced better finishes, 400% more production per machine!*

HERE ARE ACTUAL PRODUCTION FACTS		
	High Speed Steel slab mill 80 RPM	Nelco carbide tipped slab mill 410 RPM
Feed (in/min)	1¾	11½
Production per machine	6 pcs. per hour	29 pcs. per hour
No. of pieces per grind	8	250 (average)
Finish	Wavy—needed extensive polishing	Superior machine finish—only minor polishing needed

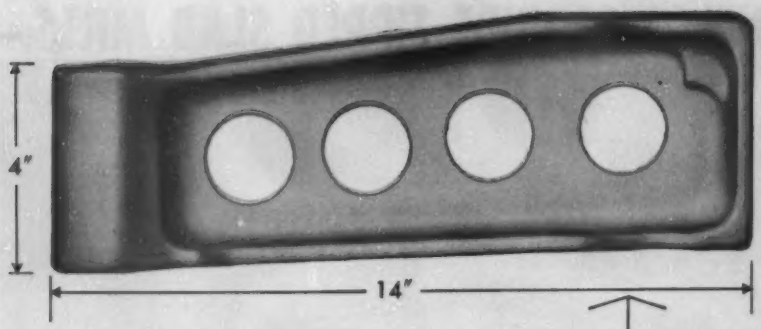
Production test this amazing slab mill in your shop—Investigate NELCO today! This example is typical of the time-saving, money-saving benefits users report when using Nelco carbide tools. With nearly 800 tools regularly stocked, you can order —and GET—"special" tools at standard prices.

For full information on the *complete* Nelco line, send today for 48 page catalog.

NELCO TOOLS

For that Extra EDGE in Production

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT



From Jet Bomber Parts
to Gas Range Burners

MUELLER BRASS CO.

Aluminum Forgings Save Weight, Save Finishing Time and Provide the Same Strength as Steel

If weight and strength are important factors in your product, then Mueller Brass Co. forged aluminum parts may be your best bet. Mueller aluminum forgings weigh only ⅓ as much as steel, yet they are approximately as strong. They make ideal parts for many applications and they are particularly desirable as parts for high speed rotating and oscillating machines because they reduce vibration and bearing loads, thus causing less wear on other parts. They possess good dimensional stability and retain their mechanical properties at high speeds and reasonable temperatures. The smooth, bright surfaces save machining time and eliminate costly finishing. Mueller Brass Co. can forge aluminum parts to your specifications in any practical size and shape from any of the standard or special alloys. Write us today for complete information.

MUELLER BRASS CO.
PORT HURON 23, MICHIGAN

Maintenance Assortment Of Hydraulic Equipment

Designed for industrial maintenance and construction work, 46-piece assortment has latest in remotely-controlled hydraulic jacks and attachments for pulling gears, moving machinery and other maintenance jobs. One hydraulic pump with swivel-connected coupler serves four hydraulic rams in set. Four-ton ram lifts from low 1-11/16 in.; 7-ton short ram, 10-ton ram and heavy-duty 10-ton ram are included.

Forty-one selected attachments adapt rams to pushing, pulling, lifting, clamping, spreading, bending and pressing jobs.

Blackhawk Mfg Co, Milwaukee 46, Wis

Damper pads for anti-vibration machine mountings do not require bolts to hold equipment in place. Made of cork plate bonded between two layers of neoprene rubber, ribbed for deflection resistance. If special conditions require, bolting, pads will be furnished with single hole drilled for equipment bolt. Also supplied with 2-in.-dia cup for load distribution under casters. VPS Elasto-rib damper.

Korfund Co, 48-39B 32nd Place, LIC 1, NY

Phosphoric acid cleaners intended mainly for parts too large for normal production cleaning methods, or for plants which don't need elaborate equipment for phosphate cleaning. 800 Series cleaners will normally be specially compounded by company's field service engineers, to meet particular users' needs. Can be applied by brush, sponge, dipping, or pouring, and can be compounded to incorporate detergency, oil solvency, and rust and scale removal.

Detrex Corporation, Detroit 32, Mich

Production Counter

Inspector pushes either accept or reject button in base of QualiCount as he checks each characteristic. Accepted and rejected pieces are each shown on two counters. In a receptacle at center of the instrument panel are a series of charts for different over-all average defective rates. Charts can be made up to suit individual requirements. Unit is self-contained and portable, operating on 115-volt, single-phase current.

American Hydromath Corp, 25-20 43rd Ave, Long Island City 1, NY

Here's modern press control at its ***SAFEST***

Yes, with the **Schrader Two-Hand Press Control** you'll find operator confidence soars—and so does production—because this easy-to-install unit can be operated only by both hands simultaneously. This means:

1 ***Production hits new highs*** **as operators, no longer worrying about personal safety, develop a new high-speed work rhythm in short order.**

2 ***Production stays high,*** **because the effortless fingertip operation with Schrader Controls leaves operators fresh and alert, even after a full day's work.**

Look over the mechanical-clutch machines in your shop. Wherever you find operators straining back and leg muscles to maintain production—tiring themselves so that they are less alert to safety precautions—*there's a real need for Schrader Pneumatic Controls.* Available for easy foot operation as well as two-hand operation as shown here, Schrader Control Sets come complete and ready for mounting on your presses.

Ask us to help you decide which of the several Schrader Control Sets will fit your needs best. Simply write us, outlining your installation—or fill out the coupon below.

Schrader

REG. U. S. PAT. OFF.

Leaders in air control since 1844

A. Schrader's Son
Division of Scovill Manufacturing Company, Incorporated
460 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. F-1

I am interested in more information on _____

Name _____ Title _____

Company _____

Address _____

"YANKEE" VISES

For Economical Work-Holding

For quick machine set-ups at low cost, you won't go wrong with a "Yankee" Vise. Takes job through every step with more speed and less work. Lifts off and on a swivel base. Squared on top, bottom, sides and front end for machine work. Easily made into a handy, economical jig. V-grooved block for holding rounds supplied with each "Yankee" Vise. Four sizes, with or without swivel base—1½", 2", 2¾", 4" jaw. Ask your industrial distributor.

DESIGNED FOR MECHANICS

Three outstanding features of "Yankee" Tap Wrenches show the thought given to their design. (1) The little knurled knob on top for starting the tap or backing out. (2) The crossbar held in the most convenient position by friction. (3) "Yankee" ratchet enables you to work in tight places. A slight back and forth movement of the crossbar is enough to make the tap cut.

For free "Yankee" Tool Book, write "Yankee" Tools, 201 West Lehigh Avenue, Philadelphia 33, Pa.

STANLEY®

"YANKEE" TOOLS

A Division® of The Stanley Works

HARDWARE • ELECTRIC TOOLS
STEEL STRAPPING • STEEL

Production Sprayer

Self-pressurized production sprayer for pre-lubrication of moving engine parts is a portable bug-bomb sprayer which operates without compressor or other mechanical or electric power and is used to dispense dgf-123 pre-lubricant in shops and factories. Pre-lubricant protects metal surfaces before regular oil is pumped to do lubricating job.

Sprayer contains 5 gal. of dry dgf-123—a micronically fine colloidal synthetic graphite dispersed in quick-drying fluid—and special hose and nozzle by which parts are sprayed. Nozzle produces blossom-type spray pattern.

Miracle Power Div, AP Parts Corp, Toledo, Ohio

Metal-Shrinking Machine

Developed by Douglas Aircraft, the machine has the capacity of 65,000-lb. pressure at the jaw on 80-lb airline pressure. It is completely power-operated, equipped with pressure-regulated pedal to increase the jaw pressure as pedal is pushed down. Through an air-hydraulic booster, hydraulic cylinder, and lever arm a pressure ratio of 1 to 1123 is developed. For strength to withstand this pressure 1½-in.-thick chrome-molly steel plates are used with 3-in. thick chrome-molly lever arm. Air and oil pressure gages indicate the required pressures.

Machine is capable of shrinking 0.120-in. aluminum sheet, and it is built with ample clearance to take various forms and contours. Over-all dimensions of machine are 28-in. square base and 56-in. height.

Calstate Engineering Service, 8517 Santa Monica Blvd, Los Angeles 46, Calif

Line of Bronze Valves Uses Coradur Stems

Stem material of R-P&C valves is Coradur and aluminum silicon bronze alloy which combines a favorable machining index with high durability. While 10% lighter than naval brass, it offers high tensile strength of 95,000 psi and about twice the hardness. Also the alloy has a low coefficient of friction.

The stems are composed of 91% copper, 7% aluminum and 2% silicon. They are being machined from cold-drawn, stress-relieved rods for complete company line of bronze globe, angle, and gate valves.

R-P&C Valve Div, American Chain and Cable Co, Reading, Pa

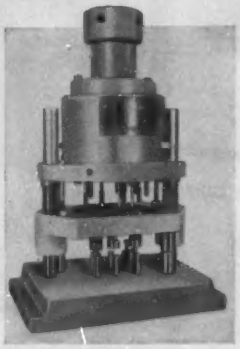
Zagar Self-clamping DRILL JIGS

NOW STANDARDIZED for DRILLING, REAMING, TAPPING

9 sizes — 5 combinations per size — for hole patterns 3" through 15" dia.

Standardization makes for quick delivery and attractive price. Only a few minor parts need be made. Speed up machining operations. The operator merely feeds the parts — the Zagar Self-clamping Drill Jig does the rest. Zagar drill jigs are now "off the shelf".

◆ ◆ ◆



Zagar drill jigs can be used in conjunction with Zagar gearless multiple-spindle drill heads to ream, drill, and tap on standard drill presses and tapping machines. Or, Zagar can quickly supply the complete "package" unit.

◆ ◆ ◆

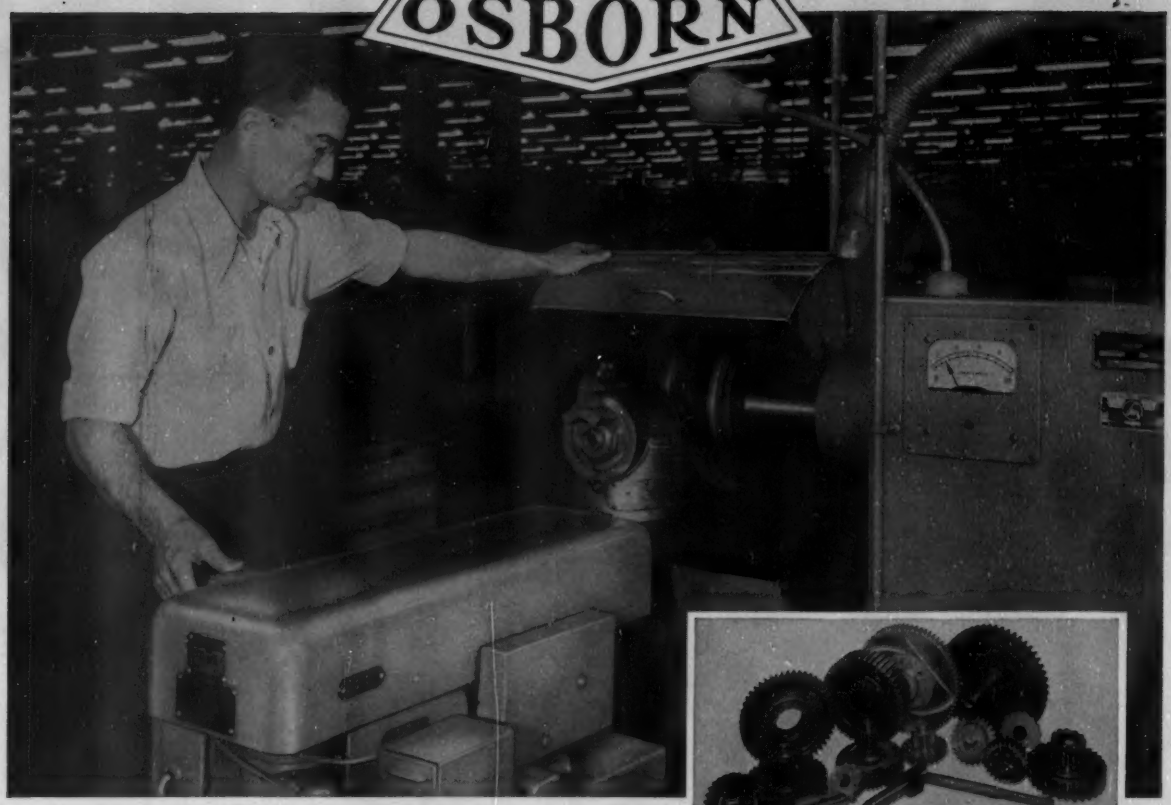
Write for Engineering Manual "A-5".

ZAGAR TOOL, INC.

24000 LAKELAND BLVD., CLEVELAND 23, O.

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

OSBORN



Brushamatics can be preset to desired time cycle for accurate duplication and uniformity of results. Above: Group of completed parts. Below: Threaded shaft set up for microfinishing.

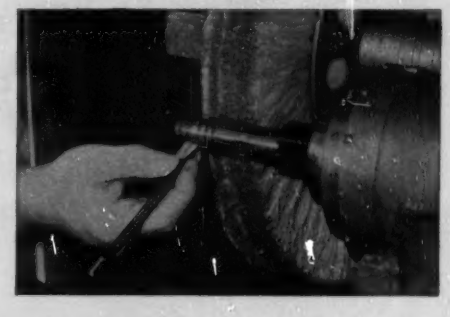
Blends surface junctures... saves over 1000 manhours

...*Power brushing* with the Osborn *Brushamatic** shown above replaced hand methods on a job of burr removal and finishing 17 different gears for material handling trucks. Net saving is over 1000 production hours a year per machine. Moreover, *quality* and uniformity of gears are greatly improved.

The operator simply pushes a button and the *Brushamatic* goes through a complete cycle to remove burrs and feather edges, and *blend* surface junctures *automatically.*

Users of *Brushamatic* machines are improving quality and increasing output as much as 500% over hand methods. Find out how your **O**sborn **B**rushing **A**nalyst can help *you* cut costs, improve quality and boost production. Call your **OBA,** or write *The Osborn Manufacturing Company, Dept. C-18, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

*Trade-Mark



INFORMATION: *Write today for your copies of Booklets on Automatic Deburring and on Brushamatic Machines.*

Osborn Brushamatic

BETTER QUALITY...LOWER COSTS...AT THE PUSH OF A BUTTON

Ross

FOUR WAY REMOTE CONTROLLED VALVE

- **May Be Removed without Disturbing Piping**
- **For Air and Low Pressure Fluid Service**
- **Working Parts Interchangeable with Ross 700 Series Base Mounted Valves**

Write for Engineering Data No. 5411

[Ross EnginAIRing — Leads in Air Controls]

Ross OPERATING VALVE CONTROL COMPANY

104 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

Shear-Seal Solenoid Valves

Series of valves is designed for 0 to 250-psi oil service in industrial application.

It incorporates Shear-Seal principle and valves are not critical to pipe scale because lapped sealing members are in constant contact. Square-corner piping action of Shear-Seal pushes dirt aside and lets it flush out through return port. No eroding occurs because flow is through sealing members and never across sealing surfaces.

Shear-Seals are self-lapping and wear-compensating. Pipe sizes of ¼, ⅜ and ½ in. are available in 4-way, 3-way and shut-off models.

Barksdale Valves, 5125 Alcoa Ave, Los Angeles 58, Calif

Sealing Tape Features Low Temperature Flexibility

Sealer with high resistance to water, oil, gasoline, and aromatic fuels features low temperature flexibility. Extruded in tape form as thin as 0.020 in. and in beads as small as ⅛-in.-dia, uniform application of this No. 590.5 tape is reported easy. It is a combination of special plasticized thiokol and asbestos fiber with excellent adhesion to metals, glass, wood and plastics. It is unaffected by temperatures to 175 F and does not become brittle or lose adhesion at —70 F. The aircraft industry is finding uses for the material in sealing glass closures, bulkheads, and fuselage openings, especially in pressurized planes.

Presstite Engineering Co, 3798 Chouteau Ave, St Louis 10, Mo

Electrical Contacts Made From Copper Graphite

Electrical contacts made from copper graphite by powder metallurgy processes are for use when high conductivity, non-sticking properties and economy are great factors.

Called Gibsiloy UC-5 and UC-7, these contacts are reported to be an improvement over copper graphite contacts because process imparts higher electrical conductivity and greater mechanical strength.

Because graphite tends to retard brazing, contacts are specially treated to provide surface satisfactory for brazing with silver solder. The company also furnishes complete contact assemblies over brazed contacts to supports provided by the customer.

Gibson Electric Co, 8308 Frankstown Ave, Pittsburgh 21, Pa

Save time in gaging large dimensions with this new Ellstrom "Build-Up" Set!

What a time-saver this Ellstrom "Build-Up" Set is when it comes to checking large dimensions to millionths of an inch accuracy! And versatile, too. Six round gage blocks in step series from one to six inches, plus a standard base one-inch high. To use, just select the right combination of blocks and wring them together on the 4" diameter base. Then add standard square or rectangular gage blocks to establish the exact decimal dimensions desired! It's quick, easy, accurate . . . with far less chance of error, and none of the normal hazards encountered in building up large combinations with regular gage blocks. Won't topple over in use . . . and if accidentally knocked over, blocks are held in rigid combination by internal locking screws. Ideal for surface plate checking, setting visual gages or amplifiers, as well as for checking work on planers and horizontal boring mills. And each block is backed by the traditional heritage of Ellstrom . . . *measuring in millionths for three generations.*

Upon Request—New fact-filled catalog containing complete specifications and prices on the entire Ellstrom Standards line. Send for it today!

ELLSTROM STANDARDS DIVISION
Dearborn Gage Company, 22035 Beech Street, Dearborn, Michigan
Originators of Chromium Plated Gage Blocks

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Jewel Brand
ABRASIVE BELTS

For grinding, smoothing, polishing — metal, wood, leather, plastics, rubber. A grit for every purpose — prompt service on every purchase.

ABRASIVE PRODUCTS, INC.
561 Pearl Street
South Braintree 85, Massachusetts

Steel Chest

Portable steel chest for stud-welding equipment, is of heavy-gage steel with welded construction throughout. Rigidly supported compartment holds tools, accessories, and small parts at top level within sight. Vertical divided supporting compartment partitions the chest so control unit can be fitted into place and locked. Remaining space holds stud welding gun, electrical cable, extensions and connectors.

KSM Products, Inc, Merchantville, NJ

Lightweight high-amperage welding-electrode-holder has 400-amp rating, weighs 27½ oz. Will handle electrodes from 3/32 to 5/16 in. Air vents between holder castings and insulation are designed to carry heat away from arc. Holder has point contact with holder casting, and wedge-shaped jaw provides high holding pressure with minimum contact area, so holder is said to run cooler.

Tweco Products Co, Boston at Mosley, Wichita 1, Kan

Lift Truck Batteries

Varley VIS 12½-in. plate and Varley VIL 16-in. plate industrial batteries incorporate: full-length plates extending to extreme bottom of battery; new-type patented separators said to end shedding and electrolyte splash; new-type patented grids with heavier and fewer members said to have longer resistance to gradual electrolytic corrosion; vibration-proof cushion design.

Battery Div, Chicago Forging & Mfg Co, 1317 W North Ave, Chicago, Ill

Manganese-nickel welding electrodes for ac and dc welding are said to weld in all positions, and join dissimilar metals. Flo-Kote electrodes contain 11-13 ½ Mn-Ni, and can be cut with ordinary oxy-acetylene flame.

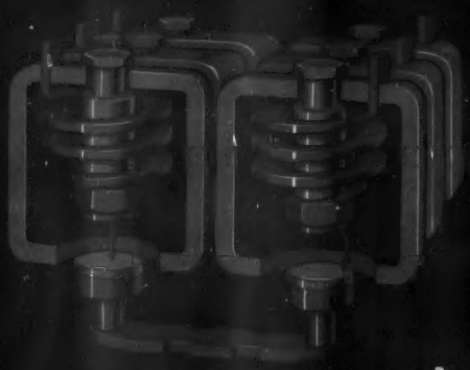
Stulz-Stickles Co, 134 Lafayette St, Newark, NJ

Dry chemical fire extinguisher has newly designed valve which is said to give trouble-free operation, even when extinguisher is partially charged and left out of operation for some time (contrary to recommended UL practice). Redi-Flo Mark II extinguishers are charged at 150 and 200 psi with dry nitrogen. Supplied in 3, 4, 5, 10, and 20-lb capacities.

Stop-Fire, Inc, 125 Ashland Place, Brooklyn 1, NY

CONTROLLED LIGHTNING

effectively control the millions of miniature lightning flashes (arcs), which bombard the contact tips — to prevent burning, pitting or build-up at any one point. This is accomplished by the use of strong multi-turn magnetic blow-outs and double-break contacts. Forced rotation causes the arc to move continually over contact surfaces to distribute the heat. Moreover, the magnetic field tends to quench the arc by either lengthening or confining it. Result: contact tips never require filing, dressing or cleaning and you get more dependable performance and longer contact life with less maintenance.



CLARK Type "CY" Starters offer many other advantages. Steel arc chambers are non-carbonizing — The solid top construction limits ionized gases between wiring terminals. Cabinets are designed to provide ample wiring space for easy installation. No tools are required to inspect contacts. All contacts as well as other components which may require service are quickly and easily accessible for inspection, removal and replacement.

THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL

1146 EAST 152nd STREET, CLEVELAND 10, OHIO

See reverse side for range of sizes, enclosures and combinations.

CLARK type "CY" AC MOTOR STARTERS

available in sizes, combinations and enclosures

TO MEET YOUR REQUIREMENTS

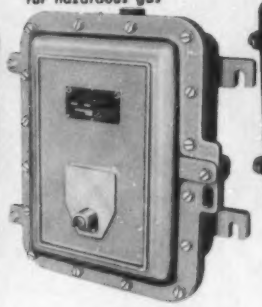
SIZES: 0, 1, 2 and 3. Sizes 2 and 3 employ the new "CY" arc interrupting principle

BASIC Across-The-Line STARTER

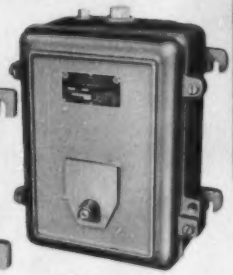
NEMA Type 1
General Purpose

NEMA Type 4
Water-tight

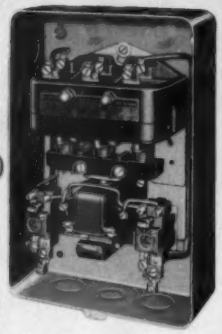
NEMA Type 5
Dust-tight



NEMA Type 7
Explosion Resisting
for hazardous gas



NEMA Type 9
Explosion Resisting
for hazardous dust



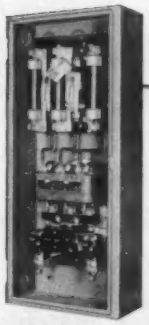
Open view — showing accessibility and generous wiring space

TYPES OF ENCLOSURES

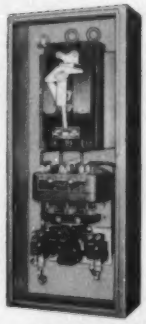
COMBINATION STARTERS

NEMA Type 1
General Purpose

NEMA Type 1A
Semi-Dust-tight



Bulletin 6018 Combination AC Magnetic Starter, with Fusible Disconnect Switch.



Bulletin 6020 Combination AC Magnetic Starter with Air Circuit Breaker.

A WIDE VARIETY OF MODELS

are available for every application within their horsepower limits.

TYPES OF ENCLOSURES

NEMA Type 4
Water-tight

NEMA Type 5
Dust-tight

NEMA Type 7 for hazardous gas

NEMA Type 9 for hazardous dust

NEMA Type 12
Industrial Type

THE CLARK CONTROLLER COMPANY
1146 EAST 152nd STREET • CLEVELAND 10, OHIO

Please send me 8-page descriptive literature on Clark Type "CY" Starters.

NAME .....

COMPANY .....

TYPE OF BUSINESS .....

ADDRESS .....

CITY AND STATE .....

Use this coupon for obtaining complete information on CLARK Type "CY" AC Motor Starters with the revolutionary new arc interrupting principle.

Friction-control and direct-feel are combined in a new micrometer caliper, which has the friction portion built into the upper part of the thimble. Thus the operator can check with either method according to his job and preference. Lower, or direct-feel section is integral with the spindle, with large dia for ease of manipulation. Available in a number of sizes and styles, including 1 in. by thousandths, and 1 in. by ten-thousandths. Catalog 26-A.

The L S Starrett Co, Athol, Mass

Dry lubricant is intended for use at high temperatures, to 1000 F, but is said to be effective to –60 F. Lubricant is fused on, usually in Everlube processing plants, but can be applied by user, if needed. For use around burners, high-temp air valves, and similar applications.

Everlube, Corp of America, 6940 Farmdale Ave, North Hollywood, Calif

Automatic hydraulic coolant valve turns coolant on and off diamond wheel dressing tool at each dressing cycle, avoiding shattered diamond resulting from operator failing to turn coolant on.

Cleveland Industrial Tool Co, Inc, 1080 E 222nd St, Cleveland 17, Ohio

Powdered metal added to electrode coating is said to double welding speed, reduce spatter, and provide strong, ductile welds. "Easyarc 12" is recommended for mild steel plate and rolled sections.

Air Reduction Sales Co, 60 E 42nd St, New York 17, NY

Disposable work cap is made of neoprene-soaked paper. Developed by DuPont safety engineers, cap is said to give same effective life as cloth cap, at about 30% cost saving. Neoprene-treated paper is said to be resistant to both acids and alkalies.

Record Industrial Co, 3301 Arch St, Philadelphia 4, Penna

Air Electric Gage For Polished Parts

Measurements with Federal air-electric gage are taken with a dual air snap and then transferred through an air-electric switch to the Electricator unit. This unit operates a set of tolernace lights. The dimensionair dials will indicate which dimension is off and how much.

Federal Products Corp, 1144 Eddy St, Providence 1, RI

Announcing a *NEW* SHEAR LINE by...

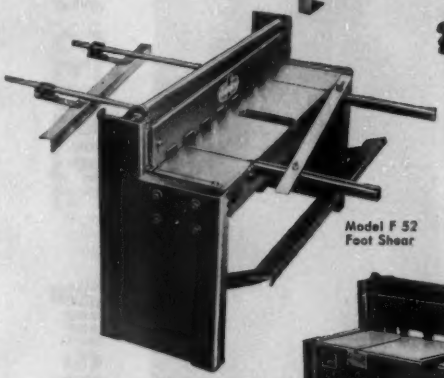
famco

18 FOOT, AIR AND POWER-DRIVEN MODELS CUT 14-20 GAUGE

Air Shears in 4 models

Capacity: 16 gauge mild steel in 36", 42", 52" and 72" widths. Feature low initial cost, ease of operation.

Model A 72 Air Shear



Model F 52 Foot Shear

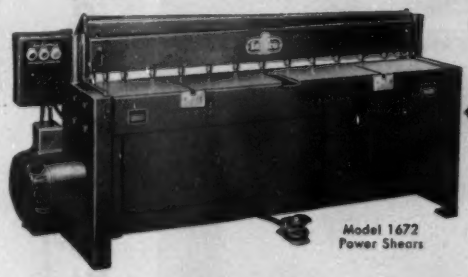
Foot Shears in 6 models

Capacity: 16 gauge mild steel in 36", 42" and 52" widths, and 18 gauge in 22", 30" and 72" widths. All-steel box-type construction.

Power Shears in 8 models

Capacity: 18 and 20 gauge mild steel in 36", 42", 52" and 72" widths. Feature "Electromatic Clutch" with faster operating speeds.

Model 152 Power Shears



Model 1672 Power Shears

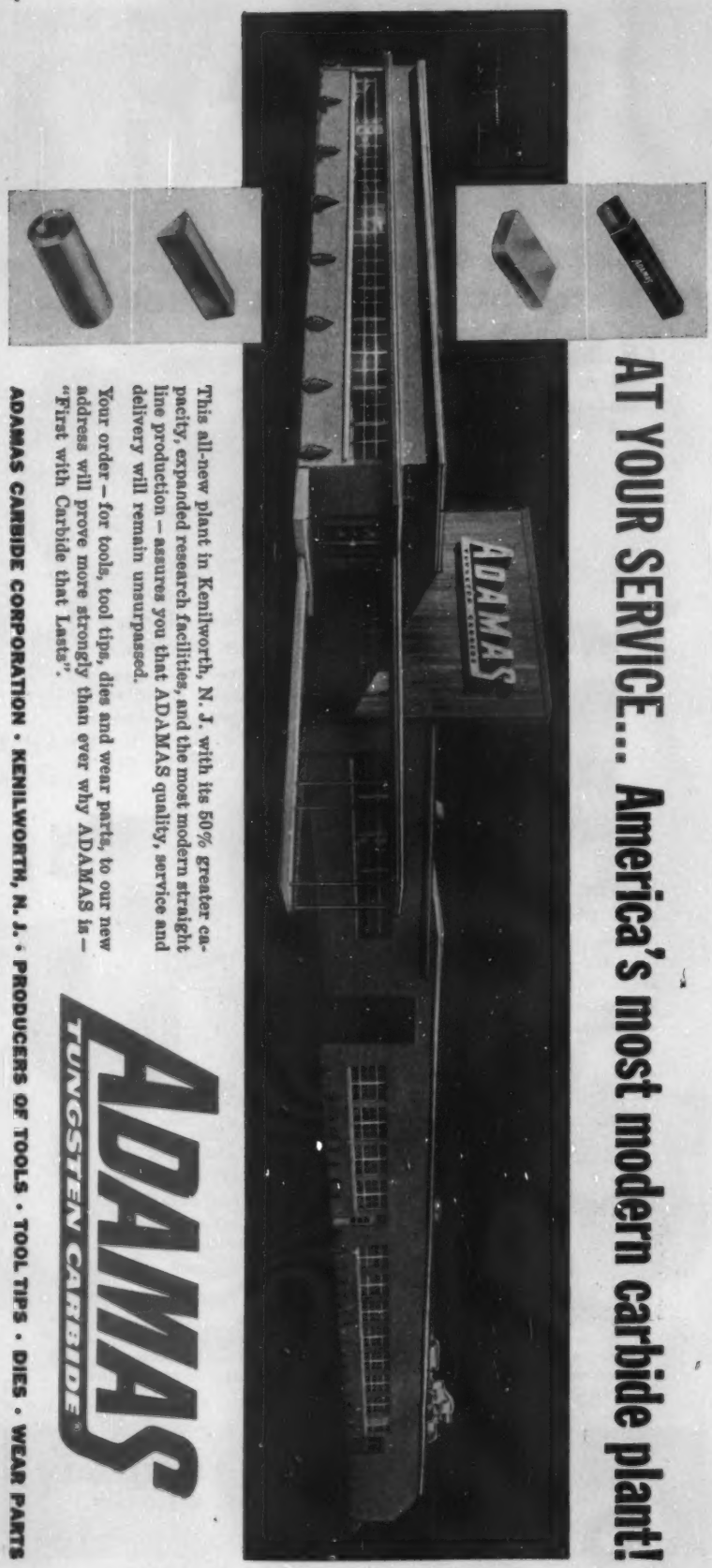
Capacity: 14 and 16 gauge mild steel in 36", 42", 52" and 72" widths. Feature "Electromatic Clutch" and rugged gear transmission, roller bearing equipped.

In its completely new Shear Line, Famco has anticipated future shear developments such as all-steel construction; 4-edged alloy blades; exclusive "Electromatic" clutch; and a new high in safety factor levels. For further details, see your dealer or write for free catalog.

famco machine company

3136 SHERIDAN ROAD • KENOSHA, WISCONSIN

AIR PRESSES • ARBOR PRESSES • BAND SAWS • DRILL PRESSES • FOOT PRESSES • POWER PRESSES • SQUARING SHEARS



AT YOUR SERVICE... America's most modern carbide plant!

This all-new plant in Kenilworth, N. J. with its 50% greater capacity, expanded research facilities, and the most modern straight line production – assures you that ADAMAS quality, service and delivery will remain unsurpassed.

Your order – for tools, tool tips, dies and wear parts, to our new address will prove more strongly than ever why ADAMAS is – "First with Carbide that Lasts".

ADAMAS TUNGSTEN CARBIDE®

ADAMAS CARBIDE CORPORATION • KENILWORTH, N. J. • PRODUCERS OF TOOLS • TOOL TIPS • DIES • WEAR PARTS

Portable magnesium loading ramp has 4000 to 16,000-lb capacity, 60 or 70 in. wide, with either fixed wheels or hydraulic lift, adjustable within 38 to 55-in. range.

Penco Engineering Co, 25 California St, San Francisco 11, Calif

Small tote-box in NesTier series is of similar design to larger models, but has dimensions of 12 x 7¼ x 4¾ in. Capacity is 200 lb with standard handles, 400 lb with heavy-duty handles.

Charles William Doepke Mfg Co, Rossmoyne, Ohio

Vernier calipers (height gage) have 0.050-in. double vernier, adjustable vernier plates, and large vernier screws. Beam measures inside or outside dimension directly. Available in 6, 12, 24, 36, and 48-in. capacities. 24-in. model in wooden case costs $189.

Allied-International Tool Co, 7070 Hollywood Blvd, Los Angeles 28, Calif

Hand cream combats drying-out of hands as a result of use of detergents and petroleum solvents. Donovo contains 15% hydrous lanolin, menthol, in hydrophilic cream base. Available in 1¾-oz and 8-oz jars. Sample available on request.

Chase Chemical Co, 1371 E 170th St, Cleveland 10, Ohio

Kilogram-scale crane scales are now available for foreign trade, at same cost as equivalent models in pound-scales. Combination pound-kilogram scales remain available in more limited size range, at slight additional cost.

Hydroway Scales, Inc, 20624 W 8 Mile Rd, Detroit 19, Mich

Lightweight (4½ oz) quick-acting air coupler allows 70 cfm of air at 150 psi. Automatic air-check cuts off supply when coupling is opened. Couples with one push, uncouples with one pull. Coupler is free-swiveling.

Lincoln Engineering Co, 5701 Natural Bridge Ave, St Louis 20, Mo

Abrasive stones of standard aluminum oxide and silicon carbide, with vitrified silicate, shellac, and phenolic bonds are available in random lots. Each lot contains about 50 assorted pieces, and costs $7.50. Several assortments available. Literature on request.

Random Abrasive Co, 449-N 6 Central Ave, Orange, NJ

Dual indicating controller will measure and control two temperatures. Also available with wet and dry bulb system for humidity and vapor gas or mercury-filled thermal systems.

Indicator has two pointers, color-coded to correspond to setpoint indexes. Bulletin 6430.

Industrial Div, Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Penna

Torque wrench has been designed to tighten nuts, bolts, and screws to exact predetermined tension automatically, without need for warning signals.

Operator sets micrometer style adjustment in the handle at exact tension desired, then pulls on handle until specific tension is reached, at which point wrench breaks automatically. Four clockwise and counter-clockwise models are available for high-speed and speed operations in close quarters.

Reasor Mfg Co, St Charles, Ill

Cemented carbide (unground) brazed mandrel nibs for drawing steel, aluminum, and other tubing materials are available in seventeen sizes, MN-450 to MN-1250. Special nibs will be furnished to specification. Standard sizes are 0.450 to 1.250 in., carried in stock.

General Electric Co, Carboloy Dept, Detroit 32, Mich

Li'l Sharpy line of hand tools includes sanders with cushion action and two-hand-hold sanding; 3-way set file for hard-to-reach corners; hand file for level operation and greater chip-clearance through cushioning and blade curvature.

The Milwaukee File Co, Milwaukee 4, Wis

Cleat in conveyor belt is vulcanized in one piece with belt, so cleat is bonded to belt, eliminating seams and gaps between cleat and belt. Cleveland Cleat Conveyor Belt is available in widths to 24 in., with cleats spaced on 9, 12, 18, and 24 in. centers, either 1½ or 2 in. high.

F B Wright Co, 1565 Oakman Blvd, Detroit 38, Mich

White steel tape is available in a 12-ft pocket size, marked off in inches, and foot-and-inches, a scale usually found only on longer tapes. For very accurate work, the first six inches are marked off in 32nds. Tape is packaged in a plastic Tenite box. High-carbon steel ½-in.-wide tape is priced at $1.89.

Evans & Co, Elizabeth, NJ

WHAT'S THE BEST WAY TO APPLY ZINC PHOSPHATE COATINGS TO STEEL?

OAKITE CRYSCOAT HC DOES A FINE JOB FOR US*

*This comment came from a Pennsylvania munitions maker, who added that Oakite CrysCoat HC has put an excellent zinc phosphate coating on 385,000 shells with "absolutely no trouble... maintenance and control are very easy."

The Oakite CrysCoat HC coating on steel products—such as artillery shells, rocket fins, auto parts, etc.—weighs more than 200 milligrams per square foot. It more than meets the requirements of U.S. Government Specifications:

JAN-C-490, Grade 1 **57-O-2C, Type 2, Class C**
PA-PD-191, Rev. A

The Oakite CrysCoat HC Process for preparing steel for painting—either in spray-washing machines or in tanks—has five big advantages:

1 The heavy CrysCoat HC coating forms a strong foundation for the lasting adhesion of paint. *See page 5 in free booklet.*

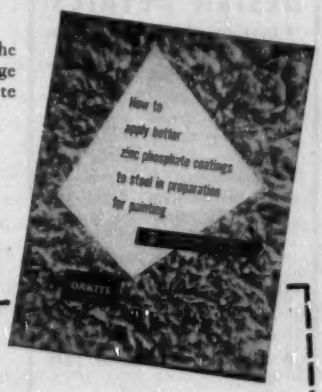
2 The heavy coating gives excellent protection against electrochemical corrosion. *See page 7.*

3 The CrysCoat HC Process is easy to control. Only one material is used for make-up and up-keep. No accelerators, starters, toners or other additives are needed. Only one simple type of titration is used. *See page 9.*

4 The CrysCoat HC reaction produces relatively little sludge and scale. *See page 10.*

5 Stainless steel is not necessary for all parts of the equipment. *See page 11.*

FREE For complete information, mail the coupon for a copy of our 12-page illustrated booklet describing the Oakite CrysCoat HC Process.



SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. and Canada

OAKITE PRODUCTS, INC.
24 Rector St., New York 6, N. Y.

Send me a FREE copy of "*How to apply better zinc phosphate coatings to steel in preparation for painting.*"

*Name*_____

*Company*_____

*Address*_____

now . . . more important than ever . . .

the efficiency, economy and dependability of Wells Heavy-Duty Cut-Off Saws

DESIGN DETAILS

- Cutting action parallel to bed.
- Easily controlled depth cutting.
- Automatic frame return and blade motor shut off.
- Large capacity — 12" x 16", rectangular; 12¾", rounds; die blocks; 12¾" deep, 16" wide, 18" clearance bed to blade.
- Selective speeds: 60, 115, 200, 300 Ft. per min.
- Ample power: 1 H.P. blade motor, ½ H.P. hydraulic system motor.
- Weight: approximately 1845 lbs.

Coupled with the Wells-O-Bar Feed Master (an optional extra) the Wells No. 12 becomes a fully automatic cut-off machine. Ask for further information.

SEARCHING for a way to reduce metal cut-off costs? Here's an answer —the Wells No. 12 Heavy Duty Saw. It's a hydraulically operated, metal cutting band saw designed to step up production with greater accuracy and eliminate unnecessary hand labor in cut-off work. Featuring an automatic cutting cycle, the Wells No. 12 also provides controlled blade tensioning, parallel-to-bed cutting and a wet cutting system.

For the efficiency, economy and dependability that you need to meet that "tougher competition ahead," find out more about the Wells No. 12. Ask your Wells Dealer for full information or write direct to the factory.

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICHIGAN

Current Business . . .

The Philadelphia office of the **Brown & Sharpe Mfg Co** of Providence, RI, has been moved just outside of the city limits to 7 Bala Ave, Bala-Cynwyd, Pa. New office is located in a recently completed building, and continues under the direction of **John J McAleese,** assisted by several men serving customers in the territory in the sale and servicing of B&S machinery and tools.

Cambridge Corp, Cambridge, Mass, has leased a 40,000-sq-ft industrial plant on the outskirts of Lowell, Mass. Production will be an extension of the work presently being done by the company, manufacturer of extreme low temperature equipment. The plant, on six and a half acres of land, is located at Electronics and Industrial Avenues, and is scheduled for mid-May operation.

A new $400,000 plant of **General Tractor Co,** said to be the only one of its kind in the Pacific Northwest to manufacture crawler-tractors, is scheduled to begin production at Ephrata, Wash, late in the spring. Initially, the plant will produce three basic models of a lightweight crawler-tractor for industrial and farm use at the rate of five units daily. The Westrak line includes a farm tractor, bulldozer, and loader, available with either gas or diesel power. Models weigh from 7000 to 9000 lb, depending on type and attachments. Plant, including 14,500 sq ft of shop space, plus engineering and office areas, is located on a 10-acre site east of the city limits.

Construction of a new **C I Hayes Inc** plant has begun at Cranston, RI, near the site where the firm has been making industrial electric heat treating furnaces since 1905. Completion is expected shortly after mid-year. Activities now dispersed among six buildings will be located in a single 60,000-ft unit. A separate and augmented laboratory section will be completely equipped with standard "Certain Curtain" furnaces and atmosphere control equipment which customers can use for experimental purposes and to develop heat treating methods for their work.

Jones & Shipman (Canada) Ltd has opened its new plant in Montreal, Canada. Offices and warehouse of the manufacturer of machine tools and small tools are located at 130 Elmslie St, Ville LaSalle, Quebec.

What shape is a quality fastener?

Here is a handful of ELASTIC STOP® nuts. Each has ESNA's familiar red locking collar . . . is self-locking and vibration-proof. Each is a readily assembled, one-piece unit. Each provides positive protection against thread corrosion . . . prevents liquid seepage along bolts. Each is made from the finest of raw materials. Each is exactly controlled as to finished dimensions, class of thread fit and finish. Each is now in use on critical applications, with a record for uniform high quality that is unmatched.

Most of them are standard parts. Some originated as the result of a specific request for ESNA's help with an important fastening problem.

Isn't it logical to call on us with your next fastening problem?

ELASTIC STOP NUT CORPORATION OF AMERICA

ESNA TRADE MARK

ROLLPIN TRADEMARK

Elastic Stop Nut Corporation of America
Dept. N62-39, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastening information:

☐ ELASTIC STOP nut bulletin

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

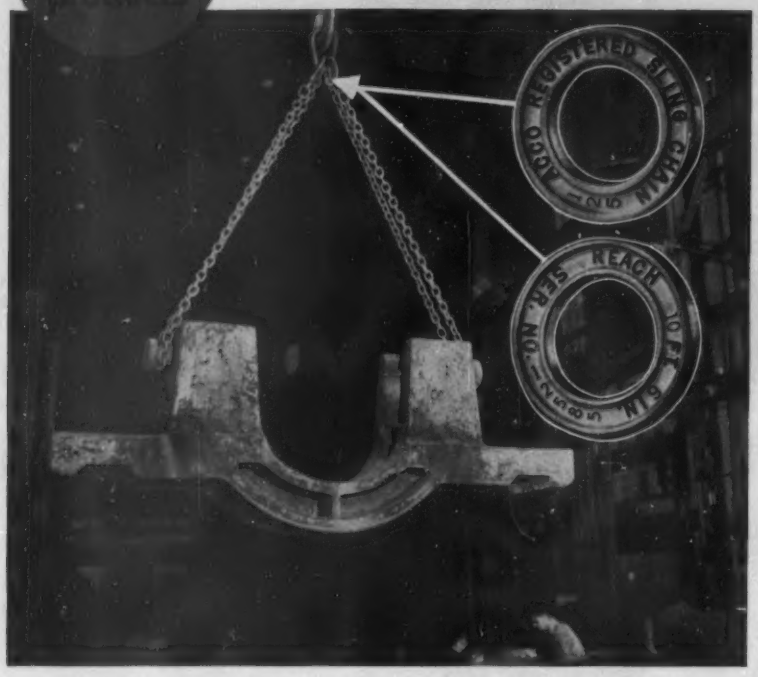
Name_____ Title_____

Firm_____

Street_____

City_____ Zone_____ State_____

ACCO Registered* Sling Chains



What would it cost you if you dropped this casting?

• How many times a day do you gamble with a heavy load being lifted over expensive machines—or men? If you have ever dropped a load, you know the consequences. Time lost, damages—a general mess.

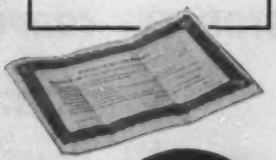
That's why you must be sure of the slings you use. That's why we suggest ACCO *Registered* Sling Chains with their inherent safety. For instance, a ⅜" ACCO *Registered* Sling Chain used in a double-basket hitch at a 60° angle has a working load limit of 11,400 pounds, almost six tons! Furthermore—it was proof-tested—overall—with a load equivalent to *twelve tons.*

With all this strength, ACCO *Registered* Sling Chains are light in weight . . . easy for your men to handle. That's because they're made of alloy chain which provides strength, great strength, with less weight.

There's much more to tell about these fine ACCO *Registered* Sling Chains. Call your ACCO *Registered* distributor today or write us for literature.

WHAT "ACCO REGISTERED" MEANS . . .

1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification ring on each sling
6. Signed Registry Certificate with each sling



*Trade Mark Registered

ACCO

American Chain Division

AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

American Bosch Corp's new branch plant in Columbus, Miss, is a 1000-sq-ft project designed to manufacture some of the company's high volume automotive products, such as voltage regulators, electric windshield wipers, and small motors. **W C Robinson,** ABC vice president, is in charge of the Columbus operation. The company will continue to produce its diesel fuel injection equipment, aircraft components, and other electrical products in its main plant in Springfield, Mass.

Jones & Lamson Machine Co, Springfield, Vt, has opened the sixth of its district offices located at Plaza Station, Charlotte 5, NC. **E H Wells,** who has been representing the company in the South for the past four years has been appointed manager. He will supervise a staff of sales and service personnel for all five of J&L's major products: turret lathes, automatic lathes, automatic thread and form grinders, optical comparators, automatic opening die heads and chasers.

CEC Instruments, Inc, a subsidiary of Consolidated Engineering Corp, Pasadena, Calif, electronic instrument manufacturer, has transferred its southeastern regional offices from Washington, DC to Atlanta, Ga. A Washington district office operating under the jurisdiction of the new regional headquarters will maintain customer - manufacturer liaison in Maryland, Virginia, West Virginia and the District of Columbia. **Joseph E Jenkins** is in charge of the office. **Charles C Snider** who has been managing southeastern regional activities of CEC for the past two years will continue to direct sales and service operations in Kentucky, Tennessee, North and South Carolina, Georgia, Alabama, Florida, and Mississippi from the new Atlanta headquarters located at 3224 Peachtree Road.

Crucible Steel Co of America has opened a new field office in Columbus, Ohio. **D W Sturges,** sales engineer, has been assigned to the new office, located at 81 East State St.

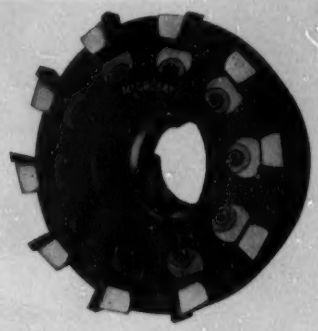
Kaiser Steel Corp has purchased approximately one third of the common stock of the **Myers Drum Co,** one of the major producers of steel drums and pails on the Pacific coast. The plant, with general offices in Oakland, is located on a 16-acre site in San Pablo, Calif. With the additional capital available, Myers is planning to expand its production facilities in the Los Angeles area.

McCROSKY

1904-1954 COST CUTTING TOOLS 50TH ANNIVERSARY

*Super-Jack**

UNIVERSAL MILLING CUTTERS



Right Hand or Left Hand Rotation

Just One Body for... **Cast Alloy or Carbide Tips**

Positive or Negative Angles

Most economical cutting equipment yet devised for shops having short runs in different metals; also unsurpassed for fine pitch, higher speed, faster feed milling with carbide.

Bodies can be bladed for either right or left hand rotation. Blade shanks are locked rigidly on radial center. Consequently, simply selecting blades having tips of the proper material, mounted at the proper angle for cast iron, steel or aluminum, produces a cutter that exactly meets any material and machine requirement. Blades are easily adjusted for regrinding . . . and can be changed quickly for different work conditions.

Shell End and Face Mills in a wide range of standard sizes. Design permits building specially engineered cutters having up to 4 times as many blades as the cutter diameter . . . particularly effective for finishing cuts and milling thin sections. Write today for Bulletin No. 531.

*U. S. Pat. 2,547,789. Other Patents Pending

McCROSKY *Jack-Lock*®
MILLING CUTTERS

Face Mills, Shank and Shell End Mills, Half Side and Staggered Tooth Milling Cutters fitted with high speed steel, cast alloy or carbide tipped blades. Sizes from 3" to 24" in diameter to meet any requirement. Write for Bulletin No. 17-M.

McCROSKY *Block Type*
BORING BARS

Individually ground and hardened tapered V-key centers the block and cutting blades accurately and rigidly yet permits easy release for regrinding, and "floating" with extreme accuracy when making finishing cuts. Wide range of stock sizes. Write for Bul. 17-B.

McCROSKY *Turret*
TOOL POSTS

These tool posts permit successive tools to be swung into cutting position quickly, indexed accurately, and locked rigidly, giving engine lathes many of the advantages of turret lathes. Four styles—11 sizes. Write for Bulletin 17-T.

McCROSKY *Super® Adjustable*
REAMERS

Complete line includes chucking reamers with straight or tapered shanks, shell reamers with tapered holes for standard arbors or large straight holes for line bar reaming. Stock sizes from 15/16" to 6" diameter. High speed, cast alloy or carbide tipped blades. Write for Bulletin 18-R.

McCROSKY *Wizard®*
QUICK-CHANGE CHUCKS

McCrosky's Wizard Quick-Change Chuck and Collet outfits hold tools centered and rigid. They enable the operator to change tools easily and quickly, without stopping or slowing down the spindle. Successive operation jobs become continuous. Write for Bulletin 18-C.

McCROSKY *Multiple Operation*
TOOLS

McCrosky "Specials" combine two or more related boring, facing, chamfering or reaming operations into a single tool saving set-up time and cutting costs. Engineered by McCrosky to your work prints. Write for Bulletin 17-S.

COST CUTTING TOOLS

McCROSKY TOOL CORPORATION

MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

announcing...

Frauenthal Division • THE KAYDON

The Frauenthal Series 3100 precision turning and grinding machine

NOW AVAILABLE FOR THE FIRST TIME — here's a machine specifically designed to perform finish turning and ultra-precision grinding operations. With it, you can produce accuracies previously considered impractical, with assured concentricity of related surfaces finished on a one-setup basis!

Originally designed to meet the exacting requirements of jet engine production, the Series 3100 machine is completely new from the ground up. Its unique design opens up new possibilities for machining large work-piece, close-tolerance jobs on a mass-production basis. The Series 3100 offers the entire metal-working industry exceptional new capacity for precision turning and precision grinding.

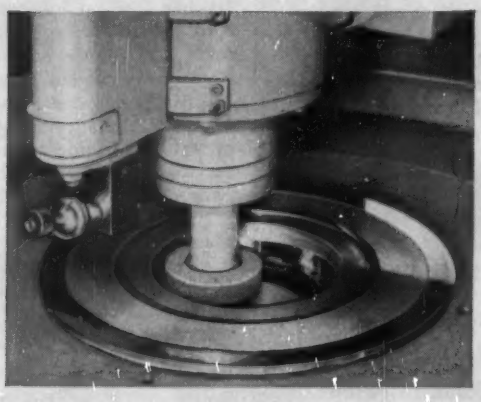
CHECK THESE IMPORTANT FEATURES

- Ultra-precision work-table bearings
- Hydraulically actuated turning slide
- Hydraulically actuated grinding slide
- Hydraulic grinding spindle
- Conveniently located controls and safety switches

. . . AND THIS OPTIONAL EQUIPMENT

- Hydraulic tracer control
- Electronic surface speed control
- Hydraulic wheel dressers for varied applications

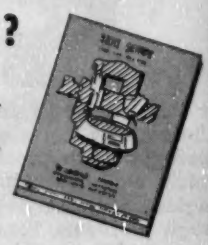
Here, the operator uses a Series 3100 machine to bore out the inside diameter.



This closeup shows how the machine performs close-tolerance finish grinding of the workpiece's top surfaces and inside diameter.

May we help you?

If you'd like to have details on how the Series 3100 can offer you new tool room or production benefits — our engineers are at your service. Write for informative bulletin No. 301.

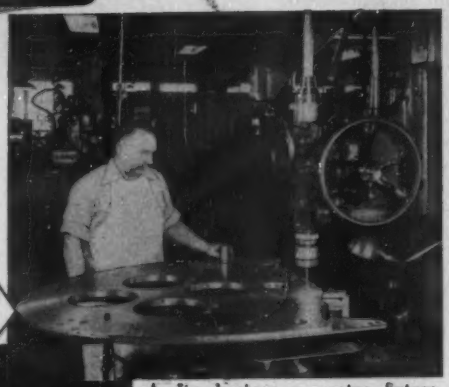


Frauenthal MULTIPLE-HEAD • SUPER-PRECISION • VERTICAL Grinders

ENGINEERING CORP. • Muskegon, Michigan

Contract Jig Boring

What B. Jahn Can Do For You!

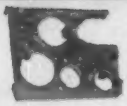


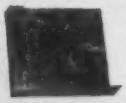
Single jig boring projects such as this jet aircraft fixture.

Jig boring a master fixture section for jet aircraft. Bushings were fitted to multiple holes with tolerances accurate to .0005".

Final inspection of one of four fixture sections for jet aircraft. This master fixture measures 18 feet when fully assembled.

Production jig boring projects such as thousands of these precision components.





Or this seemingly impossible assignment: To bore over 148 different size holes at different angles, holding rigid relative tolerances into precision alloy castings, completed value of which, was over $5000 each.

Engineers are relying on B. Jahn every day to lick their *real tough* problems. Investigate the facilities at B. Jahn. 16 of the latest jig borers, every size, manned by master toolmakers and piloted by the best engineering brains available.

Investigate B. Jahn and Invest in Production Economy!

SEND FOR FACILITY LIST AND LITERATURE — REQUESTS FOR QUOTATIONS WILL BE HANDLED PROMPTLY

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

Expansion of the Shadyside, Ohio, press plant of **Willys Motors, Inc,** which will double its capacity for production of automotive stampings, has been announced. Program involves constructioin of a 22,000-sq-ft addition to the new press facility, and installation of more than $1,500,000 in presses and auxiliary equipment which will be transferred from the Kaiser Willow Run, Mich, plant. Construction is scheduled for July 1 completion. When the program is completed the Shadyside stamping division and the press shop at the Willys main plant in Toledo will be able to produce virtually all of the body stampings required for Kaiser and Willys automotive production on Toledo assembly lines.

Raymond H Dobberfuhl has been appointed manager of the new **R & J Dick Co** office and warehouse for the southern California area. The new service center at 5276 Atlantic Blvd, Maywood, Los Angeles, Calif, marks the third west coast unit maintained by the Passaic, NJ, manufacturer of power transmission and conveying equipment. The other facilities are located at San Francisco and Seattle. Mr Dobberfuhl has been associated with the firm for the past five years serving in the Los Angeles region and as far east as Phoenix, Ariz.

A "substantial part" of the **Hughes Aircraft Co** has been donated to a newly formed non-profit charitable institution, called the **Howard Hughes Medical Institute.** The Institute, a Delaware corporation, has formed a wholly owned subsidiary corporation named **Hughes Aircraft Co.** Assets donated have been transferred to the subsidiary, which will operate the business; Mr Hughes will serve as president of the new company. Purpose of the Institute, described as the result of years of planning on the part of the flyer-industrialist-motion picture producer, is said to be medical research and development aimed at improving the "physical well-being of mankind."

Bay State Abrasive Products of Westboro, Mass, has expanded its Chicago facilities with a new $200,000 office and warehouse located at 3701 West 49th St, Chicago.

Fray Machine Tool Co has moved its manufacturing - engineering services and main offices to a new 20,000-sq-ft plant at 2935 North Ontario St, Burbank, Calif. The unit will provide additional space for the company's expanding output of universal milling machines and attachments.

SIMONDS Flat Ground DIE STEEL

...OIL or AIR Hardening

Ready for 1001 uses, Simonds "Red Streak" Die Steel offers you a choice of either OIL or AIR Hardening. Made from Simonds own steel, it's precision ground to a thickness limit of plus or minus .001", and has an extra smooth surface finish of 25 to 35 micro inches. Edges and ends are square and parallel, with all scale, decarburation and surface defects removed. All sizes come individually packaged with heat treating instructions.

SIMONDS OIL HARDENING DIE STEEL

(non-deforming Molybdenum Type) is uniformly annealed for easy machining and uniform hardening. Due to its wide hardening range (1450 to 1540) good results are assured with even the simplest heat treating equipment. Stock sizes are available from ¼" to 3" thick and ½" to 14" wide in 18" lengths. The heavier sizes also come in 36" lengths.

SIMONDS AIR HARDENING DIE STEEL

(non-deforming 5% Chrome Type) is spheroidize annealed for good machinability and uniform hardenability. Its wide hardening range (1700 to 1800 F) makes it practically foolproof in heat treating. Stock sizes run from ½" to 2" thick and 2" to 10" wide in 36" lengths.

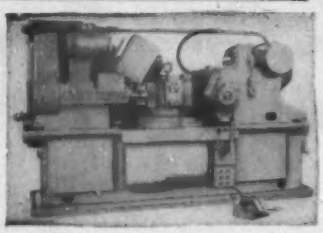
Your Simonds Distributor carries many sizes in stock — can promptly obtain any desired size. Try some on your next job.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

Single set-up covering
ALL finishing operations...

MEANS GREATER ACCURACY with GOSS DeLEEUW



AUTOMATIC CHUCKING MACHINES

One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

GOSS & DeLEEUW
QUALITY PRODUCT-BUILT

Names in the News...

R A Johns has been appointed general sales manager of the Detroit Tube & Steel Div, Sharon Steel Corp. He joined the firm as assistant manager of sales in 1947. **Robert I Petrie** has been named manager of the Order Dept at the Detroit plant.

Albert A Hally has been named general sales manager of Campbell Chain Co, York, Pa. Prior to his appointment Mr Hally was sales manager for Dennison Manufacturing Co, Cleveland.

George E O'Brien, manager of purchasing and production for Rockwell Manufacturing Co's National Meter Div at Brooklyn, NY, for the past three years, has been named factory manager of the company's new water meter plant at Uniontown, Pa.

William N Jove, Norton Co field engineer in the Chicago area, has retired after a 51-year association with the organization. **William D Bennett,** abrasive engineer in Cleveland, has also retired after 46 years of service. **Harlan W Cobb,** Cleveland office manager, has been named to succeed Mr Bennett. **Fred J Benn** has been appointed an abrasive engineer responsible for a new territory created by dividing the field formerly covered entirely by **Sherwood F Prescott.** Mr Benn will center his activities in Louisville, Ky, and cover a large portion of that state. Mr Prescott will continue functioning in the Cincinnati area, and cover southern Ohio and eastern Indiana. **William Reibitz,** formerly field engineer in Detroit, has been appointed abrasive engineer in the area, exchanging posts with **Allan Jaques.**

Harvard K Hecker has been elected vice president in charge of engineering for Curtis Manufacturing Co, St Louis. He has been with the company since 1944 as product design engineer.

W J Scott, manufacturing assistant to the general manager of the Chevrolet Motor Div, has retired. He joined the Flint plant in 1912. After serving successively as manager at Flint, and of the Detroit forge plant and the gear and axle unit, Mr Scott was appointed assistant manager of manufacturing plants, and finally general manufacturing manager before appointment to his most recent post in 1952.

"J&L 1200"

COLD FINISHED CARBON STEEL

Use "J&L 1200" steel on your tough jobs for

tops in quality

tops in machinability

tops in uniformity

tops in finish

available in all standard shapes and sizes

It's tops

"J&L 1200" Steel provides the qualities that help machine operators do top-flight work at lower overall costs. With "J&L 1200," the operator obtains: *better machine finishes . . . longer tool life . . . higher rates of speed.* This fact has been proven time and again—in shop after shop.

"J&L 1200" grades meet the compositions published by the A.I.S.I. . . . S.A.E. . . . and Federal Specifications QQS-633.

Try this steel in your own shop. Results will convince you "J&L 1200" deserves to be a regular specification for your production runs.

J&L STEEL

Jones & Laughlin

STEEL CORPORATION — Pittsburgh

ONE OF A SERIES OF ADVERTISEMENTS TELLING YOU

More light on your grinding problem . . . that's the job of a half-dozen, talented men at Sterling. These experts—engineers, abrasive technicians, production executives, and laboratory analysts—meet daily to consider the correct grinding wheels for our customers' jobs. Six specialists combine their many years of experience to make the tailor-made unit for you. Six men with but a single thought . . . better, more economical grinding from every machine in your plant.

Is this group survey idea important? We think so. So do our customers. Users of Sterling Grinding Wheels appreciate the unusual care that goes into the solution of every grinding problem presented to us. It's that little extra that pays off big. Something only Sterling offers!

We are not too large—or too small—to give every grinding problem the time and study its solution deserves. We do this daily. We are not so busy, however, that we don't welcome the opportunity to show you *on your own machines* the superior results you can gain from using Sterling's "Wheels of Industry." Write or phone us today for this extra service that doesn't cost you a cent!

SEND FOR THESE FOLDERS

This file of Sterling literature will prove valuable. Specifications are available for any kind of grinding. Send for your copies today.

THE STERLING

OF THE CLEVELAND

GRINDING WHEEL INSTITUTE MEMBER

TIFFIN, OHIO

WHY YOU SHOULD USE STERLING GRINDING WHEELS

SINGLE THOUGHT!

THE WHEELS OF INDUSTRY
STERLING ABRASIVES
Plus VALUE
ABRASIVE PRODUCTS
for
• BETTER GRINDING
• FASTER GRINDING
• LOW COST GRINDING

ABRASIVES DIVISION
QUARRIES COMPANY

BRANCHES, CHICAGO – CLEVELAND – DETROIT
DISTRIBUTORS IN ALL PRINCIPAL CITIES

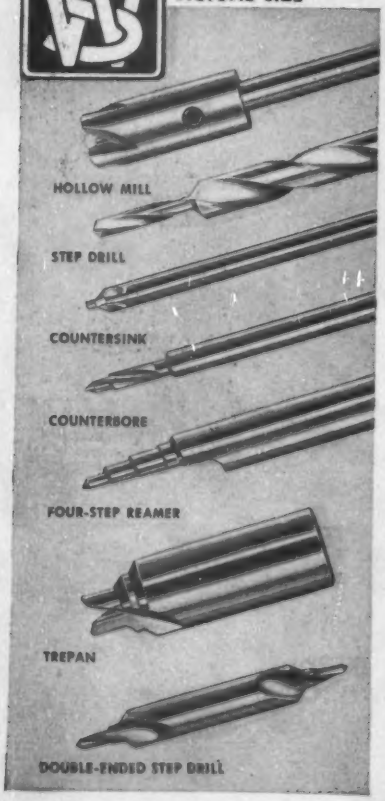
PRECISE MULTIPLE CUTTING...WITH ONE W&S TOOL cuts your production costs

Holes within holes—holes of multiple diameter, intricate profile, and great precision—can be bored in a single operation with a Woodruff & Stokes small cutting tool designed by specialists for your exact requirements. Holes from pin-point to ½" diameter—single or concentric, tapped or reamed, bottomed or through-cut—are made quickly and economically in the hardest metals with W&S tools.

If your production involves the precision machining of very small holes, let Woodruff & Stokes design into one operation a job that may now be costing you as many as five.

WOODRUFF & STOKES CO., INC.
345 LINCOLN STREET
HINGHAM, MASSACHUSETTS

Some W&S Tools ACTUAL SIZE



William T Martin, formerly manager of the Indianapolis office of Landis Tool Co, has been transferred to the home office in Waynesboro, Pa. **John Mourer,** who headed the Pittsburgh office, takes over Mr Martin's post. **Eckley Schatzman** has been appointed to take charge of the Hartford district office, succeeding **John Schobinger,** who has joined the sales staff of the Gardner Machine Co, Beloit, Wis.

Herbert J Griffing, Norton Co's encapsulating machine sales representative, has retired from the company. **Emens Guernsey,** associated with the sales engineering department of the Grinding Machine Div, has been named his successor. Mr Griffing has been selling Norton machines since 1919. From 1923 to 1929 he was assistant sales manager of the Grinding Machine Div; from 1929 to 1942, sales research engineer. Later he was administrator of the turbine section, and master mechanic.

Irvin H Fullmer, an authority in the field of precise length measurements and screw thread standardization, has been appointed chief of the National Bureau of Standards Engineering Metrology Section, formerly designated the Gage Section. During his more than thirty years of service with the Bureau Mr Fullmer has made many significant contributions to the science of precision measurement, particularly to the measurement of length by contact and interferometric methods, the standardization and design of screw threads, and the calibration of precision gage blocks.

Eugene C Clarke, Jr, vice president of Chambersburg Engineering Co, Chambersburg, Pa, has been made general manager of the company in charge of administration duties. **Kenneth W Palmer** has been named a vice president and will continue to serve as treasurer; **C Douglas Galloway III** has been appointed secretary and works manager; **George H Martin** has been made foundry superintendent.

C H Hartley has been made sales director of Servomechanisms, Inc. Located in the company's corporate offices in Garden City, NY, Mr Hartley will coordinate over-all sales and promotional efforts of the firm's three US divisions and the Canadian subsidiary, Industrial Electronics of Canada, Ltd. Prior to his promotion, he was customer liaison director of the Westbury, LI, Div.

Stuart K Oliver has been appointed sales manager of the Rawlins Brothers Div, Solar Steel Corp of California. Formerly associated with General Motors, he organized the divisional warehousing plan for purchasing and distributing tool steel in southern Ohio; in 1938 he transferred from Delco Products Div to the Electromotive Div to establish and supervise the heat treating, foundry and plating departments. During the war he was with GE's Eastern Aircraft Div as administrative engineer and director of metallurgy.

N A Lamberti has been named assistant to the vice president in charge of manufacturing of McCulloch Motors Corp, Los Angeles manufacturers of engine-powered products and automotive superchargers.

Martin Ettington has been appointed general manager of engineering for American Locomotive Co. He will be in charge of all product engineering activities at each of Alco's six plants, with headquarters in Schenectady. Mr Ettington joined the company's Alco Products Div in 1936 and was named manager of engineering sales in 1947. Last year he was made director of engineering.

Francis J Kinsella has been named manager of outside sales by the Standard Pressed Steel Co, Jenkintown, Pa, manufacturer of metal fasteners, precision aircraft specialties, and shop equipment. Mr Kinsella, a member of the firm for the past eighteen years, was formerly Midwest regional sales manager. In his new post he succeeds **George A Gade,** elected vice president in charge of sales last year.

Eric B T Kindquist has been appointed vice president and general manager of Overlakes Corp's Garfield Wire Div, Garfield, NJ. Prior to his appointment he was wire mill superintendent and assistant works manager of Eastwood-Nealley Corp, Belleville, NJ.

Thomas A Kelly has been promoted by Rheem Manufacturing Co to the newly created post of manager of manufacturing planning for the firm's thirteen domestic and twelve foreign plants. Formerly manager of the company's Philadelphia works, Mr Kelly will move to the Richmond, Calif, corporate headquarters, where he will coordinate engineering and production activities.

ALL THE FEATURES *plus*....

MATCHED ENCLOSURES!

SQUARE D's
NEW
POWER-STYLE
SWITCH BOARDS

DESIGN LEADERSHIP FEATURES

Distinctive Styling provides an attractive, modern appearance matching the control center design.

Easier Installation because removable front and back plates expose generous wiring parts. Isolated horizontal wiring trough has drop-off openings, assuring safer, neater wiring.

Flexibility. Complete sections or branch units can be added or changed to meet specific job requirements.

Easier Inspection and Maintenance. Front, side and back plates are removable, thus providing easy and immediate access to specific areas.

SEPARATELY.... OR AS A TEAM THEY DO THE JOB BETTER!

Write for Bulletin SD-18. Address Square D Company, 4060 Rivard Street, Detroit 11, Michigan.

Write for Bulletin 244. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.

SQUARE D's **NEW**
PLUG-IN
CONTROL CENTERS

DESIGN LEADERSHIP FEATURES

Increased Safety because bus bars are fully enclosed, rigidly supported and have ample cross section...circuits isolated by individually enclosed plug-in units...disconnect handle designed for maximum operator protection.

Flexibility. Individual plug-in units or complete sections can easily be added, removed or exchanged. Push-buttons, pilot lights, and selector switches can readily be added to unit doors.

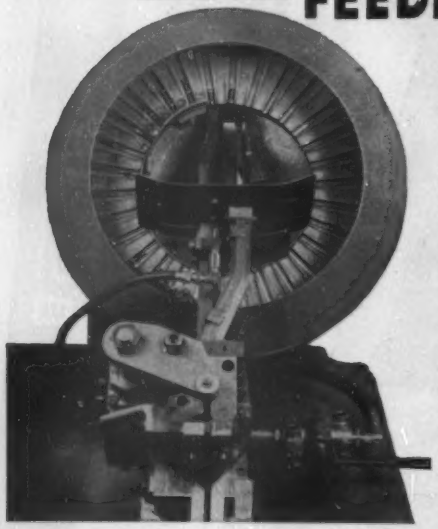
Installation Economy. All wiring channels are large and accessible from front without removing units...no "wire fishing."

Space economy, too. Up to six combination starters fit in a 20"x20"x 90" section. Plug-in unit heights are designed in space-saving increments of 3 inches.

SQUARE D COMPANY

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

Use DPS SELECTIVE FEEDING DEVICES



● Note the improvement in Lower Costs, Speedy Production, Quality Control and Increased Profits . . . Now, this DPS contribution to the metal-working industry is emphasized in an expanded line of selective feeding devices and engineering service . . . Tell us your requirements; we have the unit and the know-how to meet your needs.

DPS BARREL-FEEDER

● Here is an interesting case showing separate screws and lock washers that were loaded into a single feeder and ejected loosely assembled at the rate of 60 to 70 a minute . . . An amazing speed increase over slow, manual operation. In this instance, as in thousands of other applications, the unit was designed with the idea of maximum feeding of a wide variety of parts at a fraction of the cost of manual feeding.

DPS BOWL-FEEDER

Our Newest Addition

● An electric, vibrating unit that advances the parts on a circular spiral, aligning and correctly locating them to issue directly into the work area in proper time cycle. Provides fully automatic feeding of light, fragile parts that normally could not withstand tumbling.

Let us diagnose your symptoms and prescribe the proper remedy. Write for details.

DETROIT POWER SCREWDRIVER CO.

2821-A W. FORT ST. DETROIT 16, MICH.

NEW BOOKS

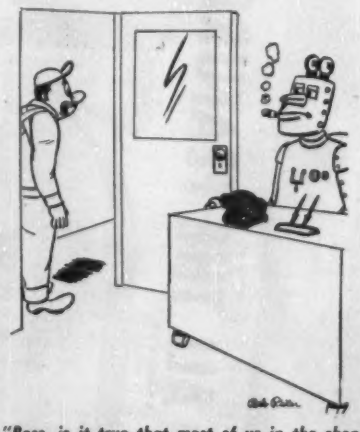
SOLUBILITY FACTOR IN METAL PHOSPHATE PRE-TREATMENTS—*By Dr Max Kronstein, Philip Hixon, and Jack Granowitz, Research Div, College of Engineering, New York University. Available from Office of Information Services, New York University, University Heights, New York 53, NY. 12 pages, 8½ x 11 in. Reprinted from Paint and Varnish Production, Dec 1953. Price $0.35.*

Originally presented as a paper at the Division of Paint, Plastics, and Printing Ink Chemistry, American Chemical Society Meeting, Chicago, Sept 7, '53, and subsequently reprinted, this booklet describes new methods of measuring chemical conversion during pretreatments of steel surfaces, and the effect on paint bonding. It discusses water-soluble matter in the phosphate coating, and the effects of chemical remnants in phosphate treatments on paint-bonding qualities.

•

INDUCTION AND DIELECTRIC HEATING—*By J Wesley Cable. Published by Reinhold Publishing Corp, 330 W 42 St, New York 36, NY. 576 pages, 9 x 6 in. Price $12.50.*

Almost everyone in the engineering world has seen or heard of the seeming miracles performed by high-frequency heating, yet a relative few are thoroughly conversant with its capabilities. To the scientist, such things as tubes, circuits, resistance, and impendance may be of absorbing interest, but the working engineer



"Boss, is it true that most of us in the shop are going to be replaced by machines . . . boss . . . my gosh! Where are you, boss?"

and production man are less concerned with what is inside the "little black box," than with what comes out of it—and with what to do with it when they've got it.

It is along such lines, therefore, that the author has prepared this book. It is divided into two major sections; one dealing with induction heating, the other with dielectric heating, each capable of being read and understood without reference to the other. History and theory are touched upon only sufficiently to provide a basic understanding of the process; the various energy sources are treated in more detail but in a way fully comprehensible to the mechanical man. The next chapter deals with the all-important subject of coil design—electrodes, in the case of dielectric heating.

From this point on follow chapters showing the various applications of HF heating in such fields as forging, melting, brazing, hardening, and other metalworking operations. In the dielectric heating section, chapters are devoted to plastics, woodworking, food processing, and similar fields.

It is doubtful whether any other book has contained such a wealth of practical information that can be made use of by so many people in so many branches of industry in which heating plays an important role.

BUSINESS MANAGEMENT HANDBOOK—*Edited by J K Lasser. Published by McGraw-Hill Book Company, Inc, 300 W 42nd St, New York 36, NY. 809 pages, 6 x 9 in. Price $8.50.*

Twenty specialists have collaborated to produce this 20-chapter volume, each expert handling his own subject on a straightforward "How to . . . ." basis. The book is concrete and factual, showing the executive how to

"Yes, I know you're doing your best— that's just the trouble."

RUGGED ALTERCUT REAMERS

Outperform

ALL OTHER REAMERS

A really rugged application for any reamer is the illustrated clearance reaming of cast iron burners for pilot generators. This reaming operation is particularly tough on reamers because they often encounter insufficient stock to cut at highest efficiency and sometimes only rub.

Under these adverse conditions, ordinary reamers would soon dull and need resharpening. Yet, this west coast manufacturer reports the 1" diameter Altercut reamers, which are operated at 75 S.F.P.M., consistently provide between 2500 and 3000 holes per grind to outperform all other reamers matched against them.

The double cutting action of Altercut reamers produces accurate holes having exceptionally fine finish. Also, because each cutting edge is preceded and followed by an edge which cuts at a different angle to the axis of the hole, there is no chattering and reamer strain is greatly reduced.

The above typical application is indicative of the unusual results you will obtain when using any reamer selected from the complete Whitman & Barnes line. For, each reamer type is designed and manufactured to provide best possible results on specific applications. There is a Whitman & Barnes reamer for your job—try it today for better results and reduced costs.

W&B

YOUR INDUSTRIAL DISTRIBUTOR
Can Give You Quick Service
On Whitman & Barnes Tools.
Contact Him Today!

WHITMAN & BARNES

40035 Plymouth Road • Plymouth, Michigan

NEW YORK • CHICAGO • LOS ANGELES • HOUSTON • ATLANTA

Progress is built

Fairbanks-Morse will also continue to supply electric motors in *old* NEMA frame sizes.

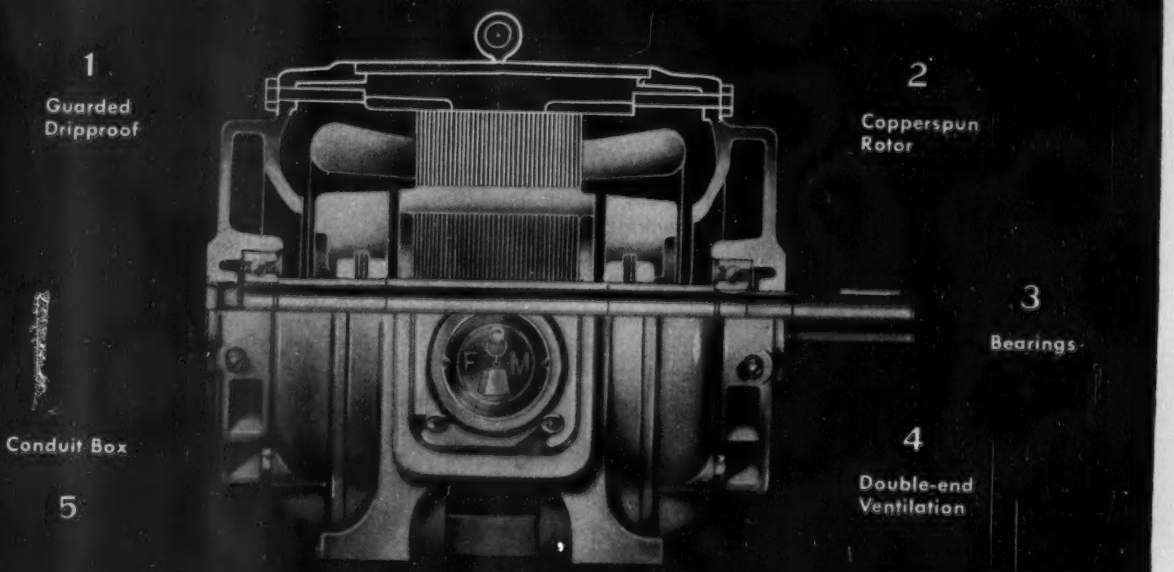
....brick by brick

The new NEMA Standard for electric motors is a significant sign of progress to all industry—More Power in Less Space.

But progress—to be lasting—must be built brick by brick For more than a century, Fairbanks-Morse designers have held to the ideal of more performance in less space. They have produced outstanding advancements in the design of diesel engines, pumps, scales, locomotives and the many other products that feature F-M exclusives. Fairbanks-Morse electric motors built on this basic F-M engineering philosophy are continuing assurance of operating economy and efficiency.

Look for the electric motor that stands on this Fairbanks-Morse solid foundation of design progress. It carries the Fairbanks-Morse Seal of Quality.

NEW FAIRBANKS-MORSE GUARDED DRIPPROOF MOTORS



1 Guarded, drippproof construction keeps falling objects and dripping liquids out of motor in any mounting position —maximum motor protection under conditions of wet or dirty operation —indoors or out.

2 Exclusive Fairbanks-Morse feature that provides a virtually indestructible one-piece rotor —homogeneous, free from flaws and gas inclusion for maximum strength and lifetime service.

3 Oversized, precision ball bearings in spacious housings, sealed against grease leakage. Contain ample lubrication for extended periods of rugged service. Convenient flushing and re-lubricating available if desired.

4 F-M exclusive design eliminates hot spots. Cooling outside air is drawn into motor through openings in lower portion of both bearing arms and circulated through cored passages in the frame.

5 New, gasketed, cast iron conduit box permits easy pulling of cables without insulation damage. Fairbanks-Morse exclusive: recess feature allows elimination of conduit box where space is limited.

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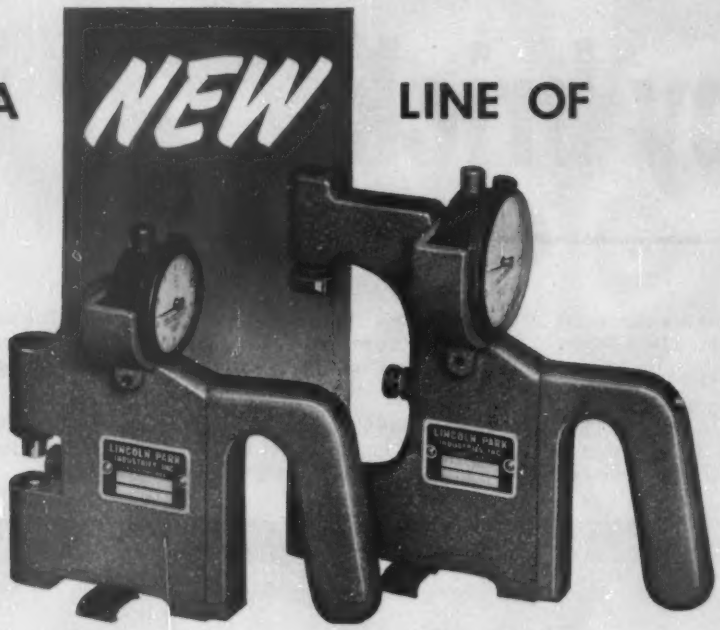

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This is not aimed at the big company, but at the small and medium-sized one, as well as individuals of broad responsibilities in large organizations.

•

CHAMBERS' SHORTER SIX-FIGURE MATHEMATICAL TABLES—*By L J Comrie. Published by Chemical Publishing Co, Inc, 212 Fifth Ave, New York 10, NY. 387 pages, 6½ x 9¾ in. Price $6.50.*

This new collection of tables is by the head of Scientific Computing Service, Ltd, London. He was formerly superintendent of H M *Nautical Almanac* and an outstanding authority. Included are these tables: logarithms of trigonometric functions to seconds, the trig functions themselves, circular trig functions, exponential and hyperbolic functions, natural logs, inverse circular and hyperbolic functions, prime numbers to 13,000, powers, roots, reciprocals and factors, interpolation coefficients, conversion tables, proportional parts, and several other less-well-known tables.

Type is large and readily readable, and table arrangement is good.

•

MACHINE TOOL OPERATION, PART II (THIRD EDITION)—*By Henry Burghardt and Aaron Axelrod, assisted by James Anderson. Published by the McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 677 pages, 5½ x 8 in. Price, $3.60.*

When explaining the construction and function of machine tools, it is hard to decide just when to stop talking about one type of machine, and start on to the next. In this book, the authors have done an excellent job of deciding. The explanations are notable for their completeness and economy.

The book describes shapers, planers, milling machines, grinding machines, and bandsaws, and also discusses hydraulics, metallurgy, and cutting fluids.

Each section, devoted to a basic

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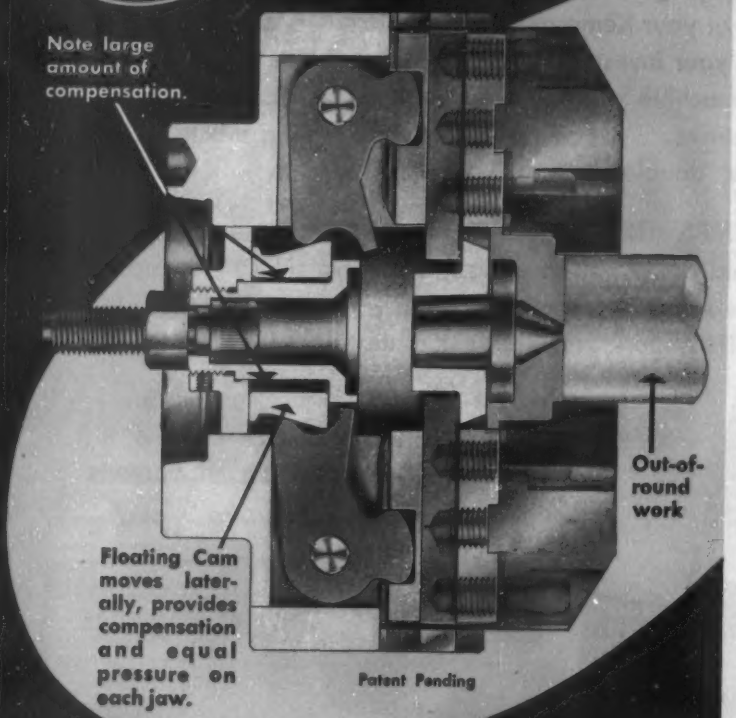
Note large amount of compensation.
Out-of-round work
Floating Cam moves laterally, provides compensation and equal pressure on each jaw.
Patent Pending

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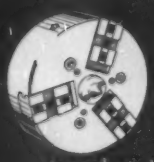

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machining operation (grinding, milling, etc), begins with a discussion of the types of machines in the category, and how the machines work. Then other aspects of the machining such as workholding methods, setups, typical specific problems and how they are solved, are described, emphasizing principles. As a result, an average reader will understand not only what steps are necessary to do a job, but also why the steps are taken.

•

INDUSTRIAL ELECTRONICS—*By Dr R Kretzmann. Published by Philips' Technical Library, (US agent) Elsevier Press Inc, 155 E 82nd St, New York, NY. 234 pages. Price $5.50.*

Although electronics is a big word, and a bigger field, these days, there evidently are a number of industries in which electronics have not yet been adopted for such uses as they can be applied. The author's aim is to present information that is basic and simple enough to give an idea of what can be done with electronics, and what are proven circuits.

He covers the general tube types, relays, counting circuits, timers, rectifiers, induction heating, and many kinds of controls. Among the 266 illustrations are many circuit diagrams, some photos of appliances and electronic assemblies, and performance curves. To a plant engineer who might not be familiar with electronics, his lead-in and introduction to the subject are sketchy. Rather the book is suitable for a college course in industrial-electronics applications, or for working engineers with some knowledge of how tubes work. As a handbook, the text is authoritative and it covers considerable ground.

"I can tell by your attitude that you've never suffered the agonizing torture of bunions."

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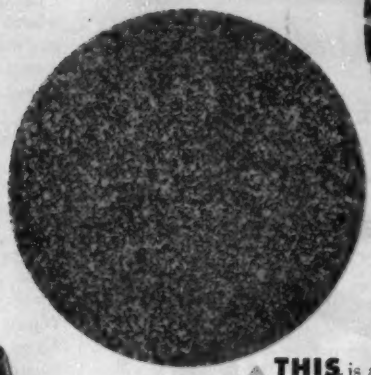

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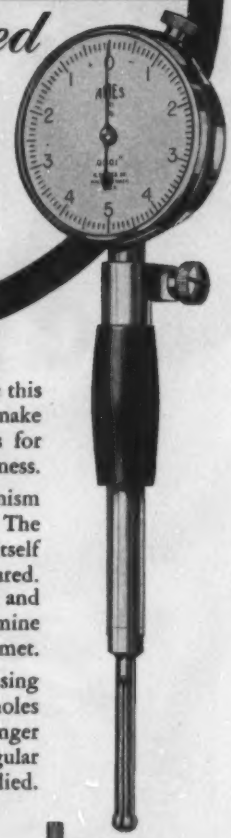
No. 36



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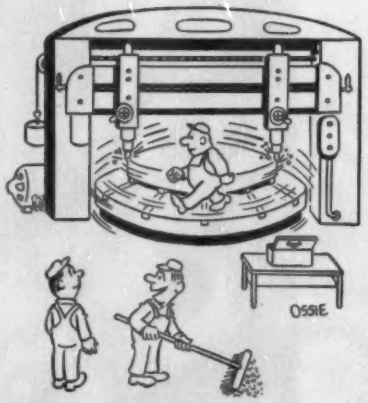
ROUND TABLE *Discussion*

Is it good or bad practice to allow employees to use company equipment for private projects during off hours? What of the possibility of injury to the worker or damage to the machine?

OVERTIME GOV'MINT

I THINK A LINE has to be drawn somewhere with regard to so-called gov'mint work before it becomes something more than a tolerated nuisance—and I use the two words with the certainty that a lot of my old shopmates are certainly going to be considerably miffed. But over the years, and in many shops, I have seen a lot of it, from the guy who used the shop grinding wheel to sharpen the kid's skates up to the wise guy who used equipment and material to undercut the shop on repair jobs that would ordinarily have come in the regular course of business. Like the poor, it will always be with us, but the right type of supervision can at least see that it is kept within reasonable bounds.

Now along comes Al with the proposition that the gov'mint artist should be officially recognized and given the freedom of the shop! Ye gods! Does the man realize the headaches he is letting himself in for, not to mention the company? Who is to supervise the sparetime geniuses and note how much and what kind of material they use? What kind of insurance can be obtained to cover the individual who may get hurt while using company equipment for his own personal projects? I could go



"Doctor's orders! He advised Leo to walk at least three miles every day."

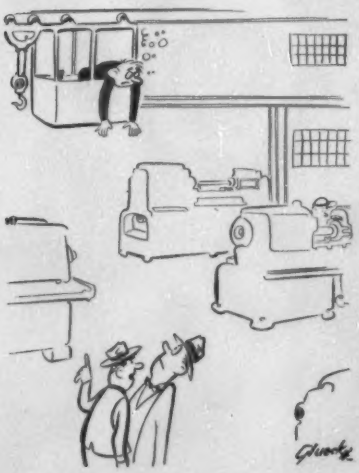
on ad infinitum with objections that come to my mind to the plan of letting a few Ed Millers loose after hours in any shop, but the few I mention should give any foreman or company something to chew on mentally before they commit themselves.

Al makes a point of stating that it would be good company relations to have the boys work off their excess energy after plant hours! That rumbling noise you just heard was some oldtime foremen turning over in their graves at the thought that a machine shop employee had extra energy to work off after leaving the shop.

Seriously, I can't for the life of me see how Al's idea is going to benefit shop morale, although I can readily see a multitude of reasons whereby shop morale could be seriously disrupted. I can imagine, for instance, what is likely to happen if one of the oldtimers comes in Monday morning and finds a lathe setup he had worked hard on, broken up because one of the weekend wizards decided this particular lathe was essential to his plans. Harsh words are likely to be spoken and the facade of shop morale is likely to be chipped, if not seriously damaged. Incidents like that are bound to occur, unless Al or someone else in authority is delegated to stick around after hours and keep an eye on things.

Taken by and large there is no question in mind that Al would be doing himself and his company a favor by answering Ed Miller and his like with a polite but firm refusal to officially sanction gov'mint work. Anything else is borrowing trouble.

Robert S Alexander
Glastonbury, Conn



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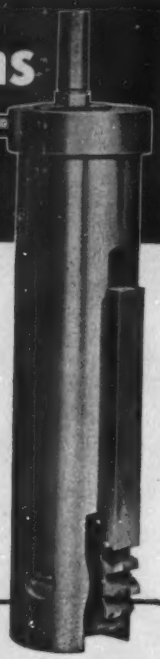
why YOU should use NATIONAL Keyseating Millers on your next job



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IT IS NOT A VERY good idea for a plant to allow its equipment to be used by employees for private projects. Assuming that the equipment is made available for use only in the man's own time, it will not be long before he starts slipping one of his own jobs on the machine during the working shift when he thinks the foreman is not looking.

Another matter is supplies of tools and materials. Even when no private work is tolerated in a plant, there is still the pilfering of tools and materials, from which all managements suffer. If the plant is to be available for the private workers on weekends, the use of plant supplies and tools, and their eventual disappearance into private jobs will be intensified. It is not that the usual run of workman is dishonest, but that the temptation to take that which is readily at hand is too great to be resisted.

When a man runs a hobby or private workshop, after leaving the employment of an actual engineering plant, he begins to realize just how much things can cost him. I have been placed in this category since I took up private consulting work; I find it extremely difficult to realize how much a couple of socket-head screws or piece of bronze rod can cost. Now that I have to pay for every item I use, it has been brought home forcibly to me how wasteful of materials are some of the shops in which I have worked.

I have known skilled engine lathe operators who, after an 8-hour day at the lathe, have gone home to put in another couple of hours on their own machines. Not all individuals can afford their own machine tools and those who can are often blocked in their efforts to start their own shops because of lack of space. Many industrial workers in Britain are city dwellers living in a very high-priced and cramped apartment without spare space for the starting of a hobby shop. The creative urge can, however, be encouraged by wise and benevolent employers.

One popular diversion for the man who likes to make things for himself is in the field of model engineering. This is quite a cult in Britain, and involves the making of railway locomotives and the like in scales varying from 4 mm to 1 in. per ft. I have never been able to understand the appeal of these models, but there is no doubt that their making has a very strong following. They involve castings, soldering, brazing, and welding in their construction, together with the usual machine tool operations.

In order to prevent the model-mad machinist from doing his own jobs in the firm's time, some large organizations have collaborated by starting and financing model engineering clubs as part of the normal range of social activities. Those organizations which run an apprentice-training school, with its own separate machine shop, have thrown open this shop for two evenings a week for the benefit of the model engineers. Other firms have gone a step further and equipped a small shop with light machine tools especially for use by the model engineering club.

The advantages of these two methods are that the members of the club must pay for their materials, although they get heat, light, power and housing free. Also, the main plant can be closed while the model engineer's own shop can be open at any suitable hour. There is a supervising committee to watch over the running of the club and to maintain reasonable standards of conduct. For instance, if allowed, some members would start building 30-ft boats in the shop.

One small general engineering firm of the writer's acquaintance used to put through the shop jobs from their own employees at a special low rate, but this practice did not amount to very much, mainly because the employee's job never got finished; there was always something more urgent to put on the machines at the time.

In a city like London, adult education flourishes in the numerous colleges during the winter and the creative machinist can obtain workshop facilities at many of these schools to make anything he likes. Some big engineering employers have helped by donating machine tools to the colleges.

There is nothing like a man having his own tools to play around with and, when he can get the space, he will start a small shop, if he is sufficiently tenacious and enthusiastic. This can be encouraged by the employer by enabling the man to buy tools at the shop tool-club at discount rates, and by giving the man free access to the scrap heap, or by selling materials at low rates.

I cannot see any reasonable argument in favor of allowing employees to use the plant facilities for furthering their own projects. The practice is conducive to workshop chaos, bad feeling, and additional expense. Some other way out of the situation must be found.

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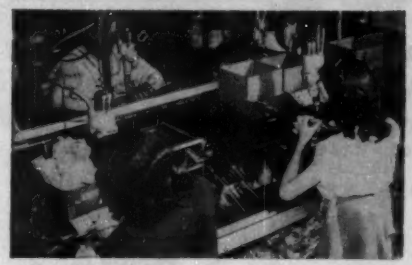

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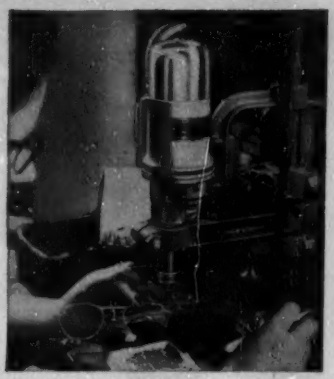

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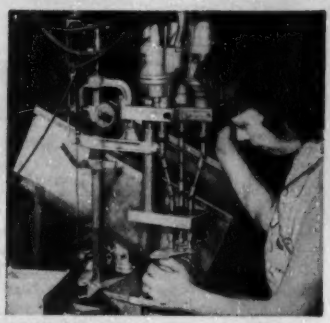

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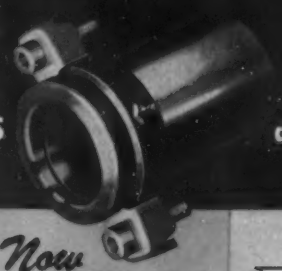

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A Clemson exclusive.

You'll find it has all the high-speed cutting qualities of the original Star "Moly"® High Speed Power Blades, *plus* being highly break-resistant. Best of all, no premium cost.

Call your Star distributor today for a trial lot of Star "Molyflex" High Speed Power Blades. Rely on him also for hundreds of the other supplies you need regularly and *quickly* to keep your production going.

Sold Only Through Recognized Distributors.

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CLEMSON BROS., Inc.
MIDDLETOWN, N. Y., U. S. A.
Makers of Hand and Power Hack Saw Blades, Frames, Metal and Wood Cutting Band Saw Blades and Clemson Hand and Power Lawn Machines.

Take the GLARE out of Micrometer Reading with the "Lustro-Chrome" MICROMETER

MEASURE TO 1/10,000th

All graduations are well-defined black lines on dull chrome surface for easier and surer reading, even in poor light. Guaranteed accurate within one half of a ten thousandth of an inch.

Drop-forged model with chrome finished micrometer head, from $8.25 up. Ask for Micrometer Catalog

No. 901C 0-1" Size with LOCK NUT and RATCHET and 10th vernier as shown $13.25

This tool with TUNGSTEN CARBIDE tipped anvils $15.75

GEO. SCHERR CO., INC. 200 AM LAFAYETTE STREET • NEW YORK 12, N. Y.

The Sharper Your Pencil ...*the better!*

Cost-minded men know that what they pay for a gear has little to do with how much it ultimately costs. Today's initial price is one thing. Performance price, computed five years from now, is something else again.

Frankly, "Double Diamond" Gears aren't built to save you a few pennies today. They're engineered and manufactured to save you *dollars* in low installed cost, satisfactory performance and minimum service requirements *over the years.*

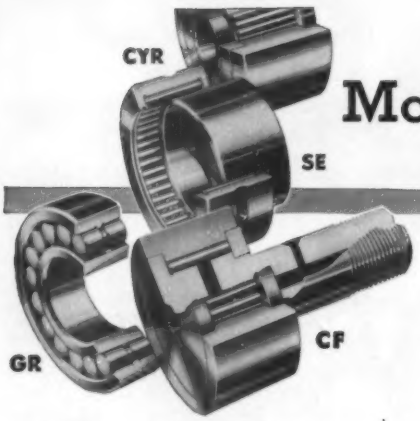
Have you sharpened your pencil for that kind of economy? True, long-haul economy? Then write.

DOUBLE DIAMOND TRADE MARK GEARS

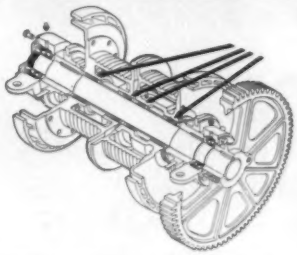
FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

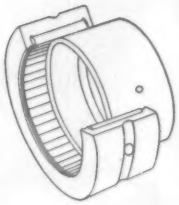
Automotive Gear Works, inc.

ESTABLISHED IN 1914 RICHMOND, INDIANA

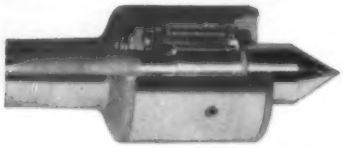


McGILL BEARING BRIEFS





MOTOR TOOL LIVE CENTERS DEPEND UPON McGILL FOR HIGH RADIAL ACCURACY



Multirol SE Bearings, press fitted into Motor Tool Live Centers, "account for accuracy and long life of these units." They take the radial loads of lathe, screw machine and grinder operation without radial looseness or play.

ROUSSELLE PRESSES USE MULTIROL SE BEARINGS EXCLUSIVELY FOR 8 YEARS

Service Machine Co., Chicago, have used Multirol SE Bearings exclusively for over 8 years on their Rousselle heavy duty presses. Two SE Bearings mounted side by side, support and carry the heavy fly wheel load on all 15, 25, and 40 ton models.

MULTIROL® *SE Bearings*

CARRY HEAVIER LOADS MORE ECONOMICALLY

On Baldwin-Lima-Hamilton Cranes and Shovels

The heavy cable loads on the Hoist Drum Shaft of Cranes and Shovels require a heavy duty bearing that occupies a minimum of radial space. The Multirol SE Bearing provides the answer to dependable performance in this application. Its trouble-free operation under heavy loads with long life expectancy has effected considerable savings in service charges for users of Lima Cranes, Shovels, Draglines and Pull Shovels.

By packing more load carrying capacity into a smaller radial space, Multirol Bearings permit use of a larger shaft and a heavier drum section. This eliminates the tendency for the crushing load of the cable to bind the shaft and reduces shaft deflection.

Baldwin-Lima-Hamilton has been using Multirol Bearings for many years and depends on such design advantages as lubrication reservoirs above roll ends, one piece outer and roller retaining end shoulders, the sealing effect of close end shoulder and shaft clearance against foreign particles, etc. To get the same dependable and long lasting performance in your products, always specify McGill Bearings.

BEARING SELECTION GUIDE
A new 140-page Bearing Selection Guide, complete with 30 pages of vital engineering data, has been released by the McGill Manufacturing Co. Ask for Catalog No. 52.

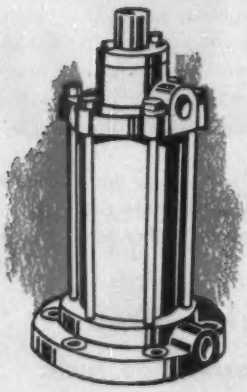
McGILL® — **Precision Bearings**
McGILL MANUFACTURING COMPANY, INC.
300 N. Lafayette Street, Valparaiso, Indiana

LOGAN . . . a national participant in major fluid power advancements

SINCE 1916

Rose Bowl New Year's Day playoff . . . great classic of one of the nation's most popular sports activities.

LOGAN HYDRAULIC CYLINDERS



750 SERIES NONROTATING TYPE 7 STANDARD MOUNTINGS

Eight standard sizes from 2" to 8" diameter bore. Maximum operating pressure 750 p.s.i.

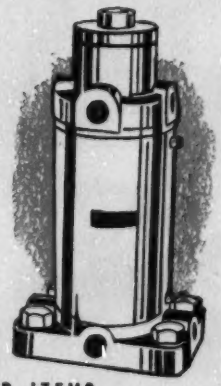
ROTATING "HR" TYPE

Seven standard sizes from 3" to 14" diameter bore. Maximum operating pressure 500 p.s.i.

ROTOCAST® SERIES 7 STANDARD MOUNTINGS

Sizes from 2" to 8" bore; any length stroke up to 8 feet as standard. Four piston rod end types. Operating pressures to 1500 p.s.i.

Consult Logan for your special heavy-duty, mill-type cylinder requirements



LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS

FREE CATALOG ON REQUEST

AIR CONTROL VALVES, Cat. 100-4 • AIR CHUCKS, Cat. 70-1 • AIR CYLINDERS, Cat. 100-1 • AIR-DRAULIC CYLINDERS, Cat. 100-3
AIR and HYDRAULIC PRESSES, Cat. 51 • COLLET GRIP TUBE FITTINGS, Cat. 200-5 • HYDRAULIC CONTROL VALVES, Cat. 200-4
HYDRAULIC CYLINDERS, Cats. 200-2; 200-3 • HYDRAULIC POWER UNITS, Cat. 200-1 • SURE-FLOW COOLANT PUMPS, Cat. 62

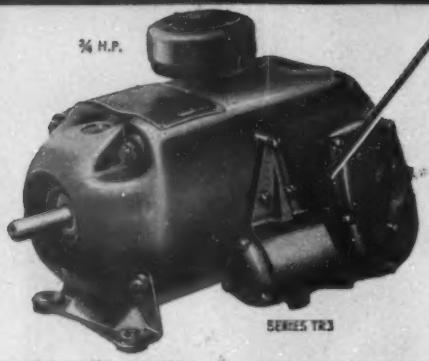
SAVES TIME — Logan — AIR AND HYDRAULIC EQUIPMENT — EFFORT • MOTION

LOGANSPORT MACHINE CO., INC., 818 CENTER AVE., LOGANSPORT, IND.

18% PRODUCTION INCREASE

Maintenance Practically Eliminated

Winding TV power transformer coils at Sparton Radio-Television



VICKERS®

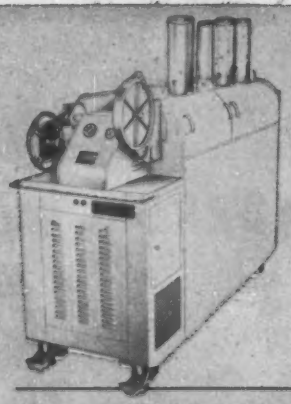
VARIABLE SPEED

Hydraulic Transmission

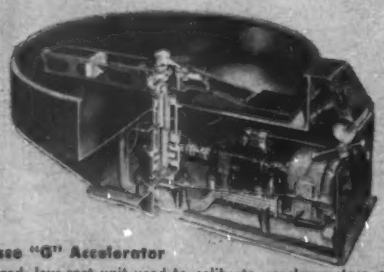
Hourly production was increased 18% when these coil-winding machines at Sparton Radio-Television were equipped with the Series TR3 Vickers Variable Speed Hydraulic Transmission. This improvement resulted from the superior control features inherent in the transmission: (1) extremely quick and smooth variations in speed, (2) maximum torque at low rpm, (3) instantaneous starting and stopping.

While the previous drives required maintenance approximately once a week, the Vickers transmissions have needed attention only three or four times since they were installed four years ago. They have built-in automatic overload protection and they are automatically pressure lubricated by the power-transmitting medium (oil).

Perhaps you have an application where this Vickers Variable Speed Hydraulic Transmission will make similar improvements and economies. Ask the nearest office listed below for Bulletin 47-40a.



Motion Picture Film Processing Machine By Houston Fearless Corp.—Another application where stepless variable speed and constant torque of Vickers Hydraulic Power Transmission provided much more satisfactory operation.



Geniese "G" Accelerator
A rugged, low cost unit used to calibrate accelerometers and other equipment under operational acceleration forces. Speed settings must be accurate and precisely maintained over extended operating periods. Driven by Vickers Variable Speed Hydraulic Transmission.

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
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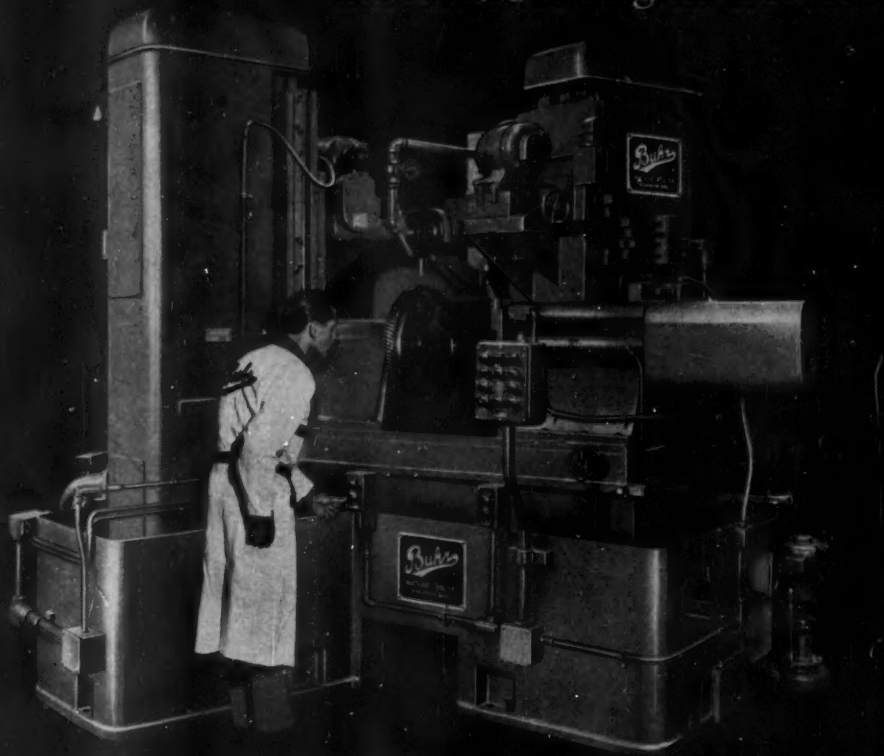
6486

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Buhr SPECIAL...

Mills both ends of 57 up to 103 slots in 16 different Jet Engine Rotors



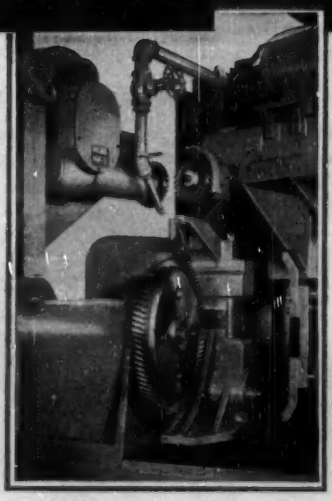
Automatic 2-spindle milling machine, arranged with automatic index for milling both ends of dove-tailed slots.

Equipped with hardened and ground laminated tool-steel ways.

Hydraulic and electrical installations to J.I.C. standards.

Automatic index unit arranged for milling the various stages from 57 up to 103 slots.

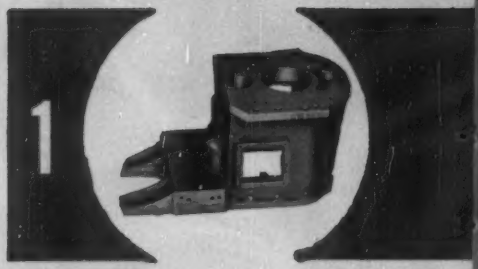
Once machine is set up for any one part, operation is fully automatic, including stop when part is finished.

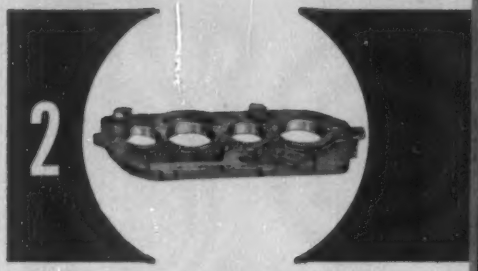


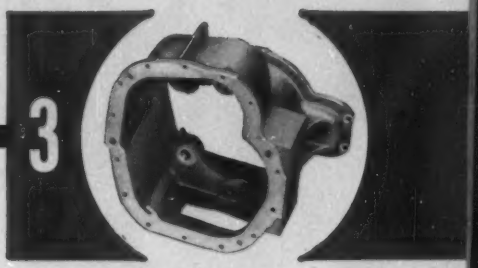
BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

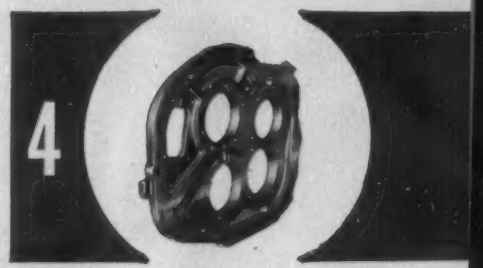
Buhr **MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY**

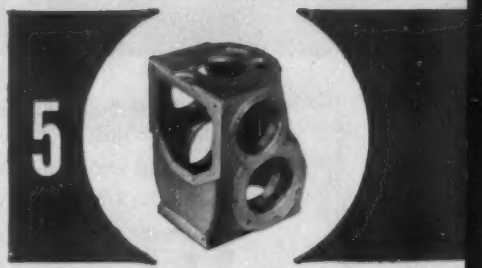
5 DIFFERENT WORKPIECES PROCESSED ON ONE W. F. & JOHN BARNES SPECIAL MACHINE











Versatile Tooling and Special Machine Precision Lower Costs, Improve Quality of Motor Grader Transmissions

This W. F. & John Barnes unit, designed and built for the J. D. Adams Manufacturing Co., Indianapolis, Ind., combines all the built-in advantages of a special machine . . . yet it machines not one, but FIVE separate and dissimilar workpieces that together form a complete transmission housing. Ingenious planning of spindle arrangement, tooling, and fixtures enables only 31 spindles to perform a total of 53 operations on the five workpieces. Special fixtures and numbered gauges locate the work and tooling quickly and accurately . . . complete change-over from one housing section to another averages only six hours.

Engineering and building a distinctive machine like this just doesn't happen by accident . . . it's the result of over 75 years of accumulated knowledge in a highly specialized field. That's why at Barnes you'll find the creative skills, plus complete and adequate facilities, for designing and building better machines to lower your production costs . . . improve product quality.

ASK FOR AN ANALYSIS OF YOUR PRODUCTION METHODS

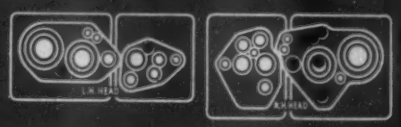
Find out how Barnes' unique creative and specialized resources can help you cut costs. Your problem will be given expert and individual attention.

W. F. & JOHN BARNES

BUILDERS OF RATIONAL MACHINE TOOLS

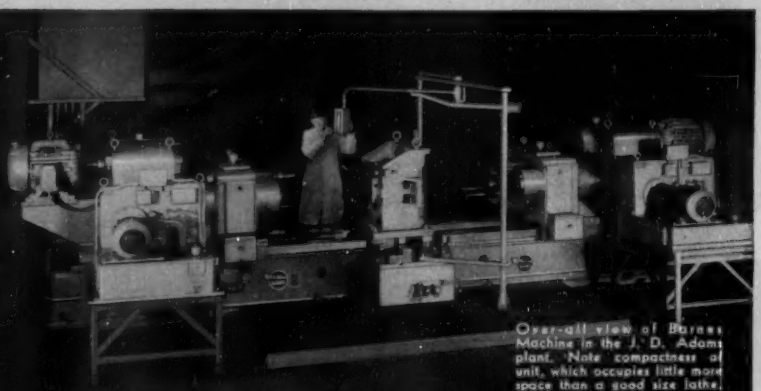
MULTIPLE SPINDLE DRILLING • BORING • TAPPING

LOWER TRANSMISSION CASE



Drawings illustrate the spindle arrangement in the opposed heads and how they are individually tooled to perform chamfering, rough, semi-finish and finish boring, and facing operations in the five different workpieces. Two auxiliary heads mounted at right angles to the machine bore dowel holes in the Final Drive Housing.

INTERMEDIATE PLATE



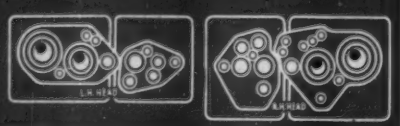
Over-all view of Barnes Machine in the J. D. Adams plant. Note compactness of unit, which occupies little more space than a good size lathe.

UPPER TRANSMISSION CASE

UPPER TRANSMISSION CASE COVER

Closeup of fixture used for Upper Transmission Case. Note rings for quick removal. Spindle housings are divided and gear bases separated from housings to minimize heat rise.

FINAL DRIVE HOUSING



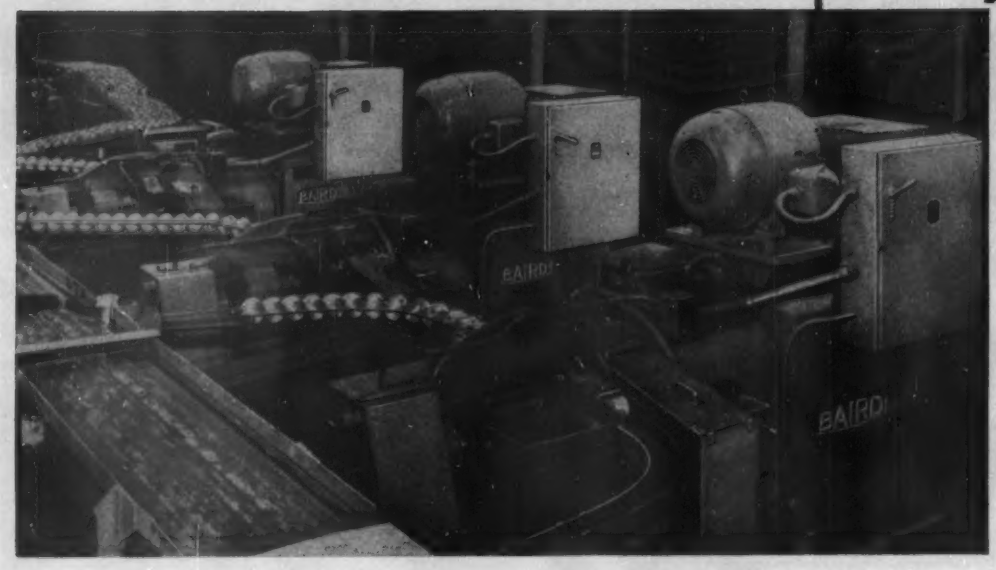
INVESTIGATE BARNES' 6-POINT MACHINE TOOL BUILDING SERVICE . . .

A Coordinated Creative Engineering and Manufacturing Service designed to help you solve problems quickly and efficiently. Write today for your free copy of "*Coordinated Machine Engineering*".

MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT



ENGINE PISTONS *travel fast* THRU *automatic* ASSEMBLY of BAIRD 6-SPINDLE CHUCKERS

With push-button operation in many large metal working plants, the Baird Chucker has graduated from a valuable single unit to an invaluable assembly for completely automatic production lines.

Higher, constant speed is one reason . . . minimum manpower . . . and maintenance of close tolerances during continuous removal of metal is, perhaps, the outstanding feature. The photo above shows an assembly of three Baird Chuckers automatically machining engine pistons in a leading automobile plant.

In this instance, operations include finish turning of the engine piston and finishing the oil ring grooves to size.

This Model 76H Chucker (7" chucks, 6-spindle horizontal machine) combines, in a single indexing cycle, such operations as turning, facing, drilling, tapping, threading, grooving and chamfering, if required.

Electrical and mechanical safety devices prevent damage when any motions are out of time or sequence. All tooling is easily accessible . . . spindle speeds are individual and variable. Design and construction assure long service life. If you require repetitive production of this nature . . . hand load or unload or entirely automatic . . . ask Baird about it.

3BA54

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

NEW FORMGRINDING CATALOG SHOWS HOW TO GET UNEQUALLED SPEED, ECONOMY, VERSATILITY WITH GEARGRIND AUTOMATICS

YOUR PARTS—for aircraft, automotive, and many machinery applications, will be ground faster, more accurately on Geargrind Automatics. See how and why in this comprehensive catalog—just off the press.

This book tells how and why Geargrind Automatics give you

- greater variety of work
- operations never before possible
- an unmatched combination of features
- engineering assistance that's *really* helpful

SEND TODAY

THE GEAR GRINDING MACHINE CO.
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Please send me your new Geargrind Machine Catalog.

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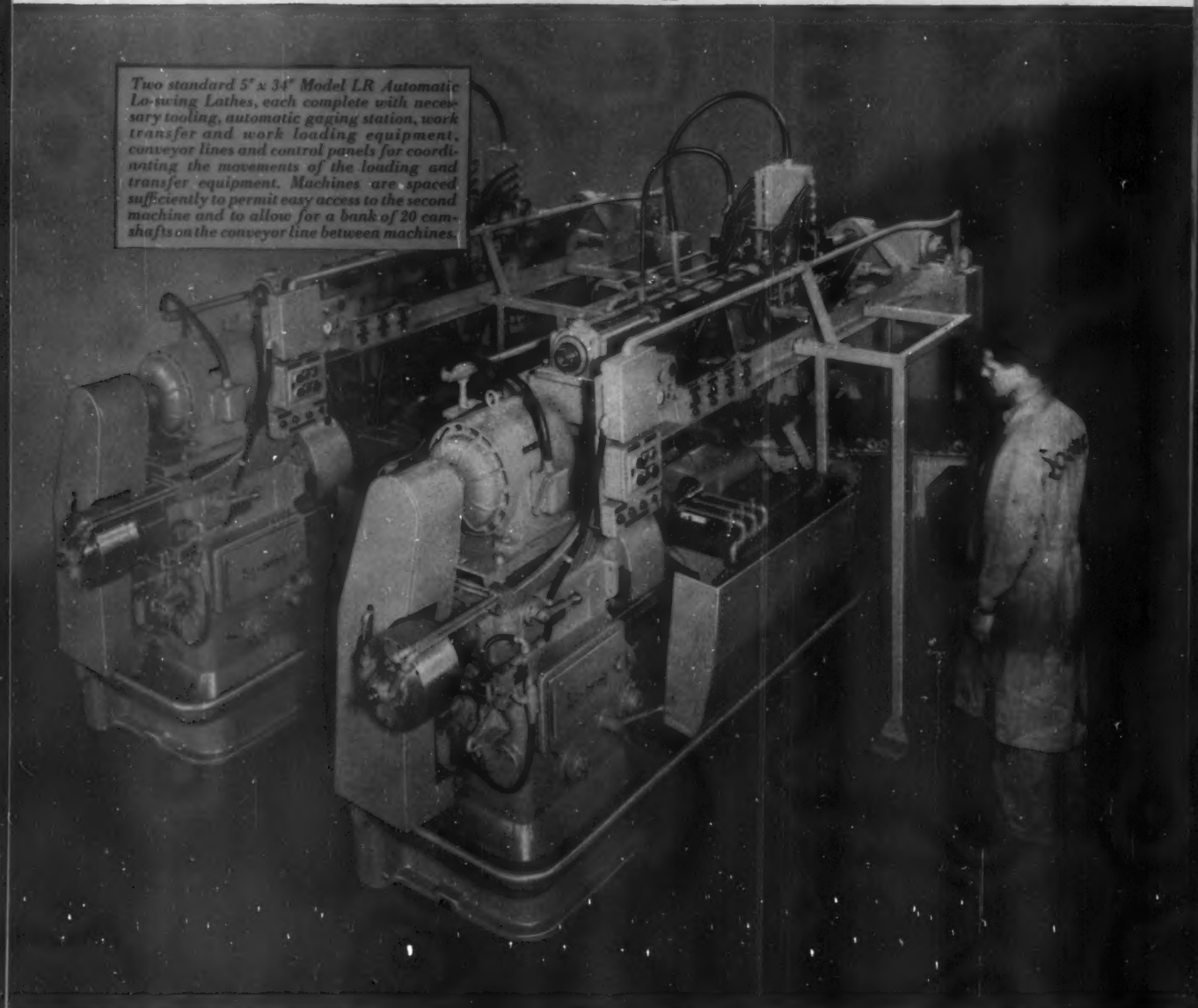
GEARGRIND
Detroit

MACHINE OF

Lo-swing AUTOMATIC WORK LOADING AND TRANSFER EQUIPMENT CUTS CAMSHAFT MACHINING COSTS

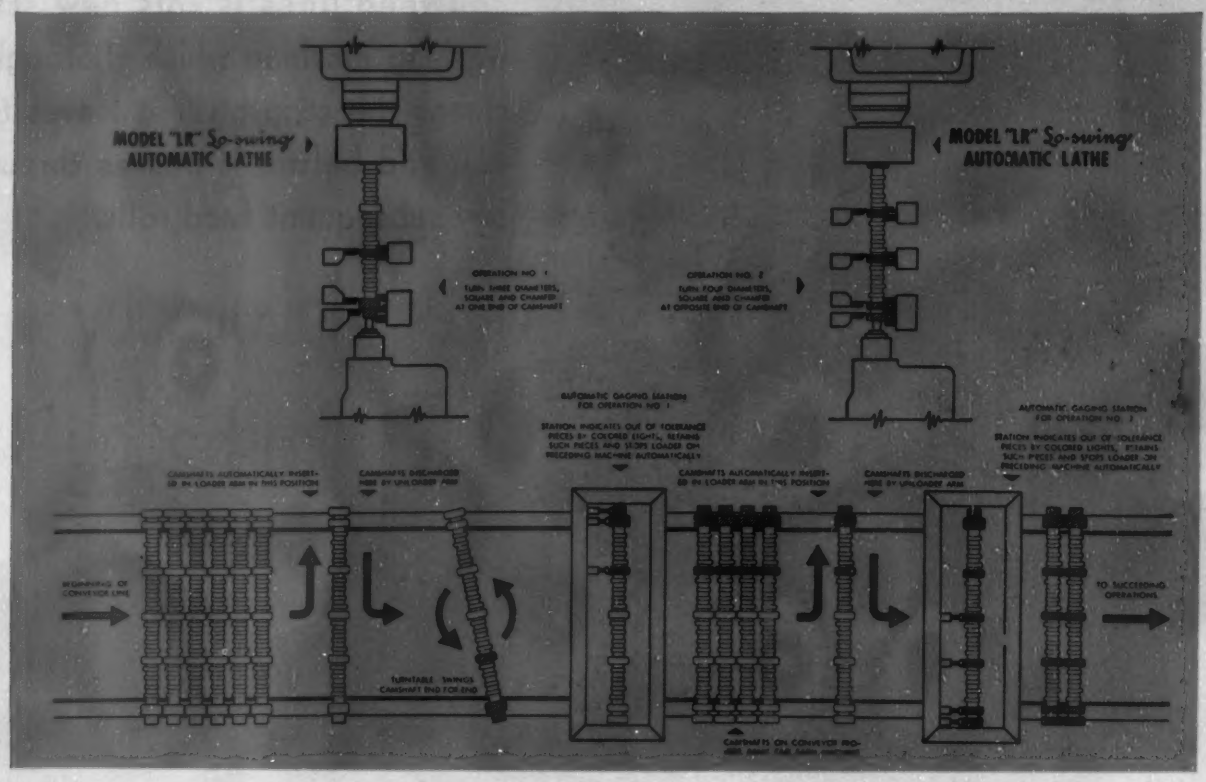


Two standard 5" x 34" Model LR Automatic Lo-swing Lathes, each complete with necessary tooling, automatic gaging station, work transfer and work loading equipment, conveyor lines and control panels for coordinating the movements of the loading and transfer equipment. Machines are spaced sufficiently to permit easy access to the second machine and to allow for a bank of 20 camshafts on the conveyor line between machines.

PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK


MODEL "LR" Lo-swing AUTOMATIC LATHE
MODEL "LR" Lo-swing AUTOMATIC LATHE
OPERATION NO. 1
OPERATION NO. 2
AUTOMATIC GAGING STATION FOR OPERATION NO. 1
AUTOMATIC GAGING STATION FOR OPERATION NO. 2
CAMSHAFTS AUTOMATICALLY INSERTED IN LOADER ARM IN THIS POSITION
CAMSHAFTS DISCHARGED HERE BY UNLOADER ARM
CAMSHAFTS AUTOMATICALLY INSERTED IN LOADER ARM IN THIS POSITION
CAMSHAFTS DISCHARGED HERE BY UNLOADER ARM
BEGINNING OF CONVEYOR LINE
TO SUCCEEDING OPERATIONS
TURNTABLE SWINGS CAMSHAFT END FOR END
CAMSHAFTS ON CONVEYOR PROCEED ABOUT THE SAME DISTANCE

PROBLEM: To automatically load, transfer and process camshafts through two machining and two gaging operations.

SOLUTION: The Lo-swing Automation Method selected comprised two Model LR Lo-swing Lathes complete with necessary tooling, Lo-swing automatic work loading and transfer equipment, automatic gaging stations and the necessary control system.

The tooling is designed for rapid replacement. The front turning tools are fitted with adjusting screws which are pre-set in the tool room after the tools are ground. No tool setting is required at the machine. The rear facing and chamfering tools are mounted in magazine type tool blocks which are quickly replaced by other magazine blocks having pre-set tools.

The installation requires no operator and is so designed that cycle time on individual machines may vary without disrupting overall operation. Safety and quality control devices instantly detect and signal off-tolerance pieces. The gaging instruments employed are electrically-operated, trouble-free, accurate and fool-proof.

Significant advantages of this Lo-swing Automation Method are:

- Elimination of operator fatigue due to mechanical handling.
- Reduction of labor and unit costs due to automatically controlled machining and handling time.
- Improved quality control due to automatic gaging as each piece leaves the machine.
- Reduction in work spoilage and salvage expense.
- Reduction in number of operators required for a production line.
- Elimination of damage to parts which frequently occurs with hand loading.
- Reduction of accidents due to limitation of human reflexes.
- Straight line conveyor feeding which simplifies plant layout.

Write for your personal copy of the new Lo-swing brochure, "Automation is the Answer", which illustrates and describes Lo-swing Automation Methods in detail.

ARE LOWER WITH *Lo-swing*

WASH THAT DIRTY STRIP
BEFORE SHEARING and BLANKING

McKAY
PRESS FEED AND CUT-UP LINES

The latest development in McKay coil feed lines is this new strip washing machine which thoroughly cleans the strip after it leaves the coil and before it passes through any subsequent feed rolls.

In most stamping plants a sizeable portion of metal finishing costs and quality control problems can be traced to the fact that some coiled steel is dirty and much of this dirt picks up on the rolls of the processing equipment. The dirt which carries over on the blanks may cause scratches in the drawn panels during the forming operations.

In several recent installations McKay has furnished a strip washing machine which utilizes high speed brushes and large volume solvent sprays to thoroughly clean the steel strip at high production speed.

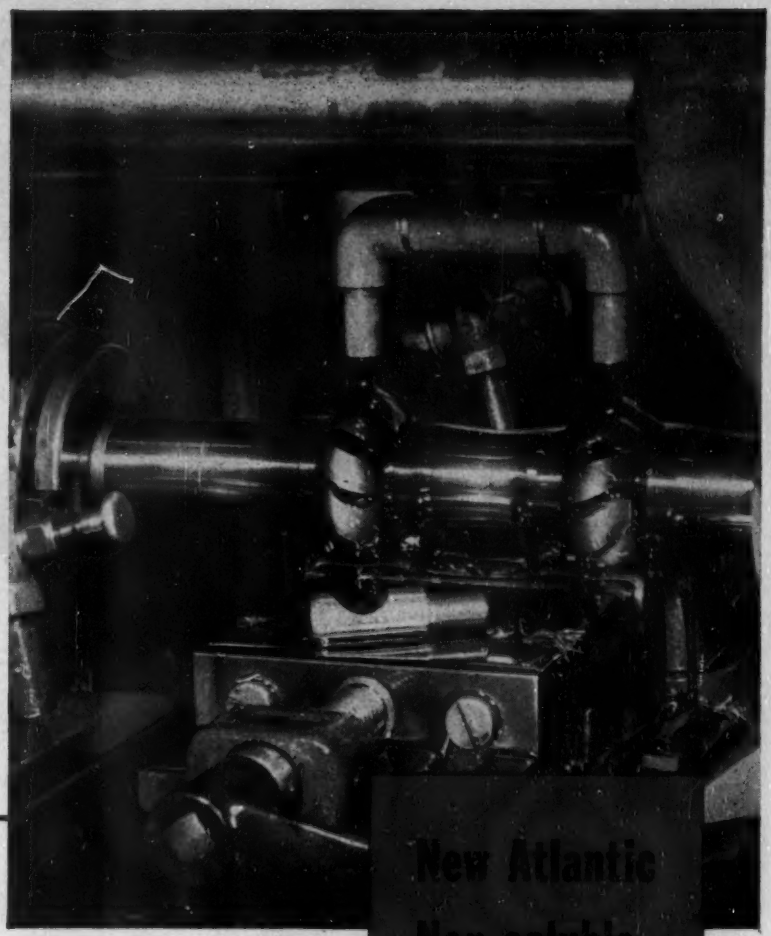
CONSULT McKAY ENGINEERS IF YOU HAVE A PRESS OR SHEAR FEEDING PROBLEM. WE INVITE YOUR INQUIRIES.

The McKAY MACHINE Company
YOUNGSTOWN, OHIO

McK

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMOTIVE, FABRICATING AND STEEL INDUSTRIES

Try them on your tough jobs first



The toughest job in the shop is the real test for cutting oils. And we want you to know how good these Atlantic Cutting Oils are.

So try them on your tough jobs: deep hole drilling, threading, difficult milling. You'll notice results that you perhaps never had before: Long tool life, superior finish, cool work, freedom from foul odors, ability to see the work right through the oil. These oils are compatible when blended even down to the heaviest grades.

Your operators will like these new oils, too. Because they don't indelibly stain hands or clothing. They mean a cleaner shop—something everybody will appreciate.

Atlantic engineers have prepared a valuable new Cutting Oil Selection Chart. It shows how to select the proper cutting oil based on cutting oil efficiency rather than chemical composition. Get your copy. Write your nearby Atlantic office listed below, or The Atlantic Refining Company, 260 South Broad St., Philadelphia 1, Pa.

ATLANTIC

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READING, PA., First and Penn Aves. PITTSBURGH, PA., Chamber of Commerce Bldg.
CHARLOTTE, N. C., 1112 South Boulevard

The Big Trend in Metalworking...

MOVE the metal ...it's cheaper than

HOW NEW METHODS SAVE BIG SUMS

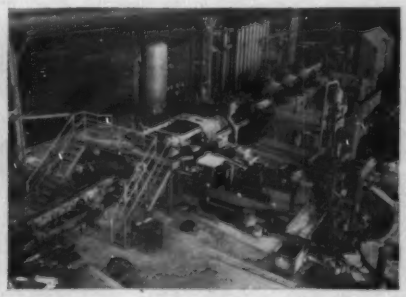
A. Parts are produced primarily by forcing metal into the desired shape rather than by "removing" or "machining" it. It is far faster . . . saves tremendously in time and labor.

B. The amount of metal in the initial slug, shot, billet, sheet, etc., is only slightly more than the total amount in the finished piece. Thus scrap and machining are held to an absolute minimum.

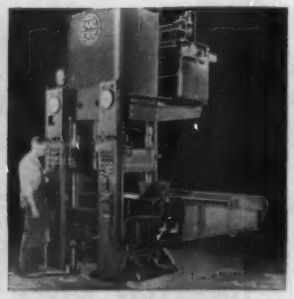
Metalworking plants casting about for ways to reduce production costs are turning more and more to the newer methods of forging, drawing and extruding in which metal is being "pushed around" rather than "removed." These processes basically are the hot extrusion of alloy steel, cold "pressure" forging of aluminum, cold extrusion of steel, and high pressure closed die extruding of aluminum and other non-ferrous alloys. Also falling within this category

Closed die extruding of heated aluminum reduced production time 99%.

Cold steel extrusion reduced scrap 43%.



Hot alloy steel extrusion is now an established art.



Metal powder parts are often produced with no machining.

● *New and improved production techniques save millions... arouse widespread interest*

1. Actual parts production is cut from hours in typical cases to minutes or even seconds.
2. Pieces generally have superior finish and improved physicals including grain structure.
3. Tolerances and uniformity equal or better those of older methods.
4. Scrap is greatly reduced and in many cases practically eliminated.
5. Unit costs go way down.

REMOVING it!

are somewhat older though greatly changed and improved methods for the extrusion of aluminum, hot forging of ferrous metals, powder metallurgy, deep drawing of sheet and die casting. The most recent developments involve variations and combinations of the above applied to many products and materials. Our engineers are in close daily contact with these developments. They'll be glad to help apply any of them to your production. Call or write us.

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HYDRAULIC PRESSES

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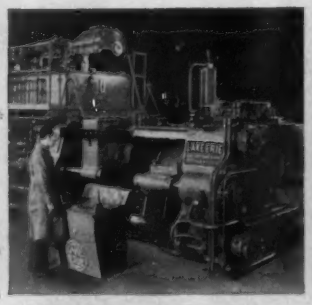
HYDRAULIC PRESSES • DIE CASTING MACHINES
ROLLING MILL AUXILIARY EQUIPMENT

New developments in steel forging have greatly expanded its application.



Non-ferrous extrusion installations now embrace titanium, magnesium and newer metals.

Production rates of die cast aluminum and zinc parts have been upped 20% to 30%.

PACKAGED INSTALLATIONS

A new service by Lake Erie which enables you to order an integrated installation ...including production equipment, tooling auxiliary equipment and advisory service ...from a single source thereby saving time, money and trouble.

LAKE ERIE●

FROM J&B

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The *"Panto-Miller"*

- Engraves
- Profiles
- Die Cuts
- Mills

A sturdy, production tool for 2-dimensional cutting in steel, cast iron, non-ferrous metals and plastics.

Pantograph reductions from 1:1 to 1:40. Spindle speeds infinitely variable from 1,200 to 11,500 RPM without belt changing.

Extreme accuracy and freedom of motion. Write for "Panto-Miller" details.

JOHNSON & BASSETT, INC. *Production Tool Div.*
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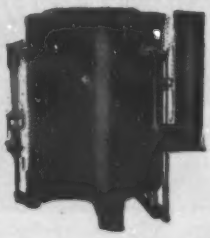
2. RAPID, ACCURATE JIG POSITIONING

This indexing trunnion, with station selector, accurately holds and locates either jig or work. SIMPLIFIES JIGS. REDUCES SET-UP TIME.

Ask for "TRUNNION" information

BUZZER *Gas* **FURNACES**

NO BLOWER or POWER NECESSARY



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Just connect to your gas supply and this BUZZER Atmospheric Pot Furnace is ready for operation. An innovation in design they are unbeatable for salt bath or lead hardening. Even heat, close control, high efficiency are only few of the many features. Available in many sizes.

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121 South Grand Avenue, Baldwin, L. I., N. Y.

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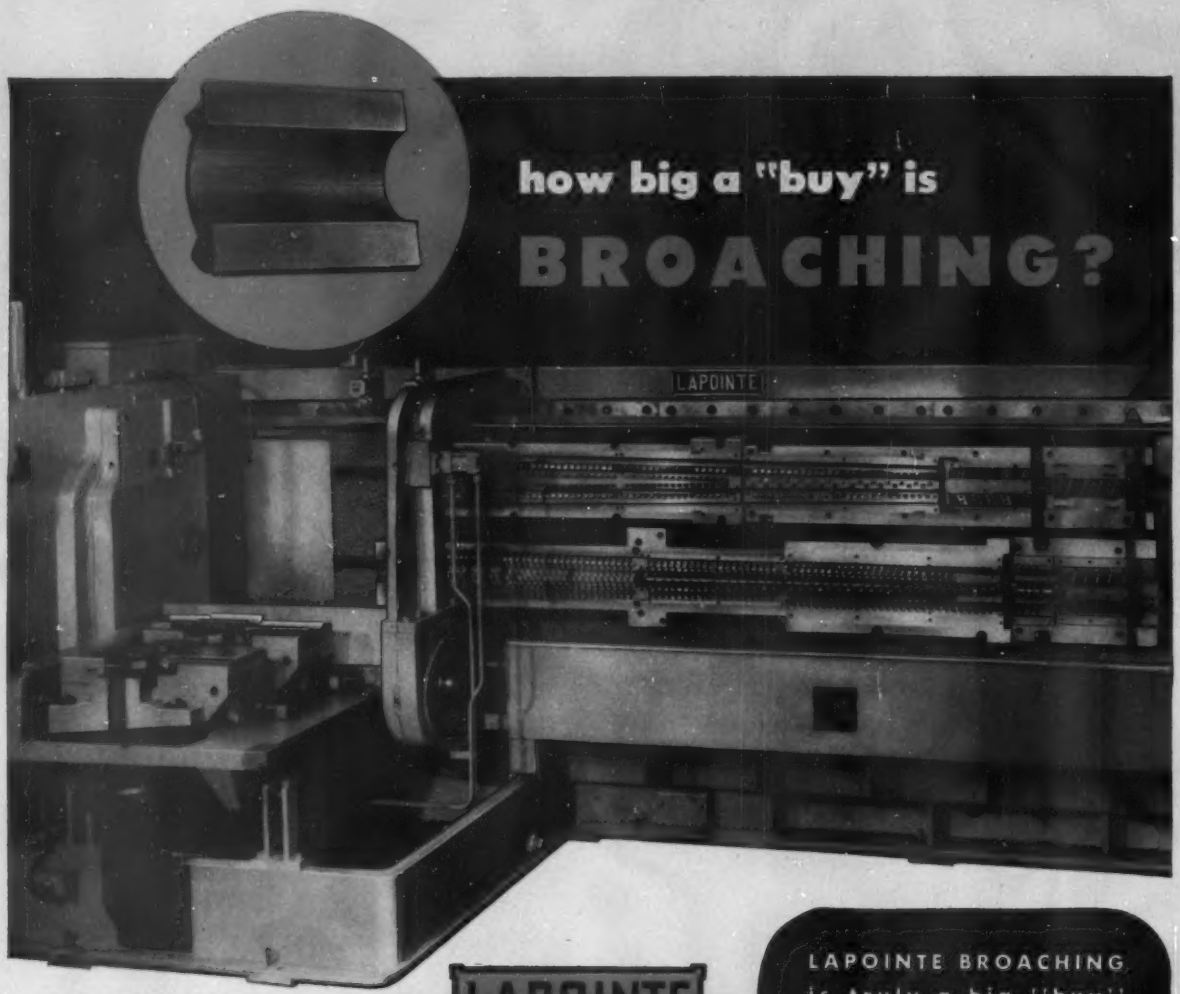

a neat question . . . and LAPOINTE comes up with a neat answer in this amazingly smooth-operating

50 hp 120-inch stroke single ram horizontal BROACHING MACHINE with ELECTRO-MECHANICAL DRIVE

LAPOINTE BROACHING is truly a big "buy" in these days which require the utmost in production speed, the maximum ability to meet tolerance and finish specifications, and the lowest possible production costs.

Full **CARBIDE-TIPPED TOOLING** and a broaching speed up to **160 feet per minute** result in a production of 125 clusters per hour (625 individual bearing caps) completely broached in the same stroke as follows:

1st station: broach back face and boss. 2nd station: finish broach joint faces, edges, and adjacent chamfers.

Send for new bulletins on Lapointe electro-mechanical drive broaching machines:

Single ram horizontal, SRHE-2

Double ram vertical, DRVE-2

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

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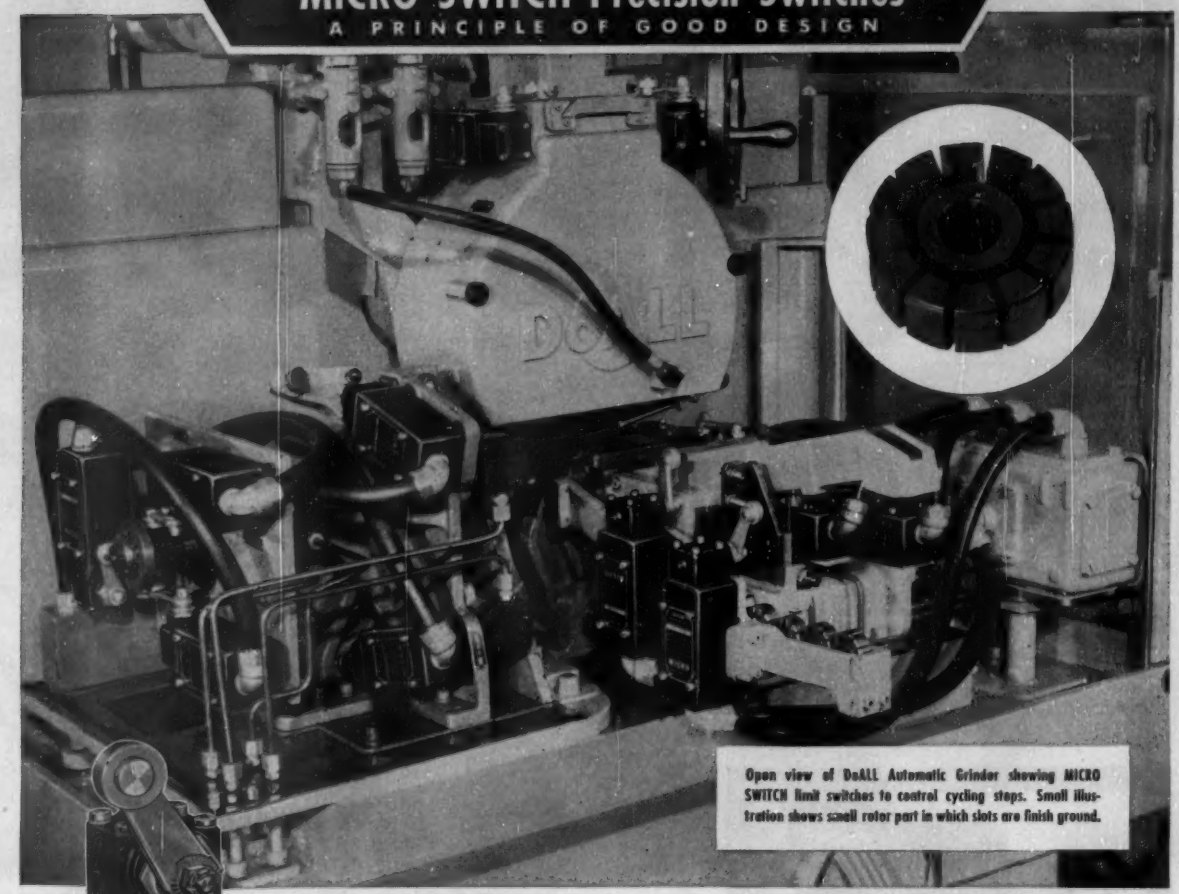
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

MICRO SWITCH Precision Switches

A PRINCIPLE OF GOOD DESIGN



Open view of DoALL Automatic Grinder showing MICRO SWITCH limit switches to control cycling steps. Small illustration shows small rotor part in which slots are finish ground.

Here's a heavy duty switch that operates precisely over 57,000 times a day

• MICRO SWITCH heavy duty limit switches are designed for *both* precision and reliability.

Precision switches for control of the automatic steps in this DoALL Automatic Grinder had to be ruggedly housed, unaffected by oil splash, conveniently mounted and actuated, and capable of sensitive, high-speed operation—some of them every 1½ seconds, three shifts a day. That means 57,600 precise operations in a 24 hour period, day after day.

Engineers of the DoALL Company included 17 of these MICRO SWITCH heavy duty limit switches to control the finish grinding of 12 slots in a small rotor part. Three different types of switch actuation were required—roller arms, rollers and straight plungers. Versatile adjustment of roller arm and roller mechanisms in these MICRO SWITCH heavy duty switches permitted mounting in minimum space.

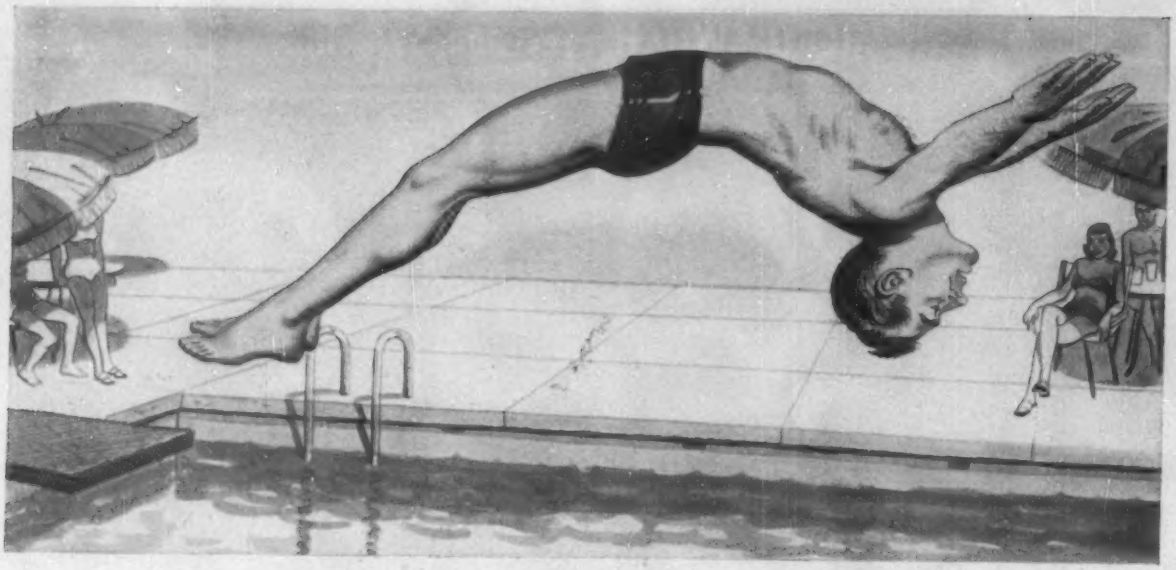
Characteristics and performance of MICRO SWITCH precision switches are as broad as the field of industrial requirements. Their extremely accurate repeat performance through millions of operations offers greater reliability and longer life than you will ever need. MICRO SWITCH field engineers, skilled in their application, are located at 16 branch offices. Consultation with them can often save time and money.

MICRO SWITCH provides a complete line of extremely reliable, small-size, high-capacity, snap-action precision switches. Available in a wide variety of sizes, shapes, weights, actuators and electrical characteristics. For all types of electrical controls.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

FREEPORT, ILLINOIS



CONTROL

...you get it with a Minster Press

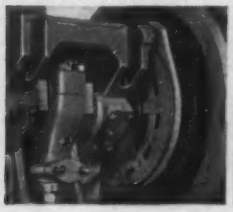
Minster P2 "Piece-Maker" press, one of eleven press series. Engineered for high production and long die life.

■ One of the standout features of a Minster press is the high degree of machine control maintained by the operator at all times. Heart of this control is the Minster combination friction clutch and brake.

And what a heart it is with its fast starts and stops . . . smooth engagement . . . instant response . . . and added protection in event of air or power failure. Press control is important, not only in actual operation, but in maintenance, set-up, and adjustment. You get it all with a Minster.

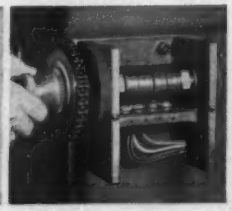
THE MINSTER MACHINE COMPANY, MINSTER, OHIO

Minster combination friction clutch and brake. Unequalled control plus a remarkable performance record for long-time, trouble-free operation.



Minster pedestal mount, one of many control station variations available to meet individual requirements for press operator performance.

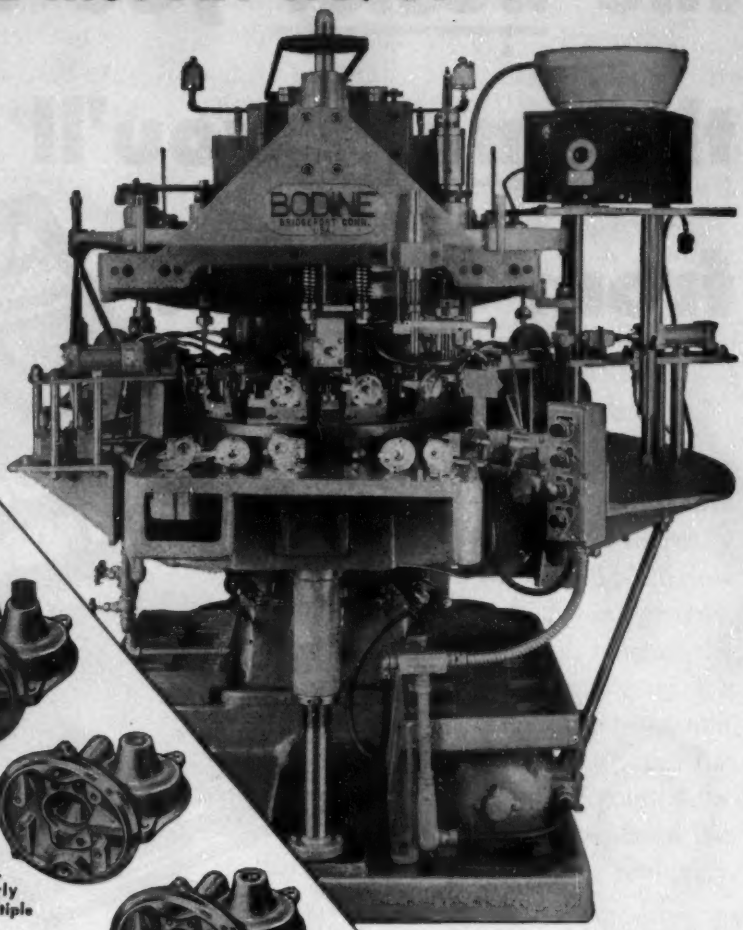
Minster rotary limit switch. Small, compact, trouble-free and with non-bouncing contacts. Easily adjusted to changes in press speed.

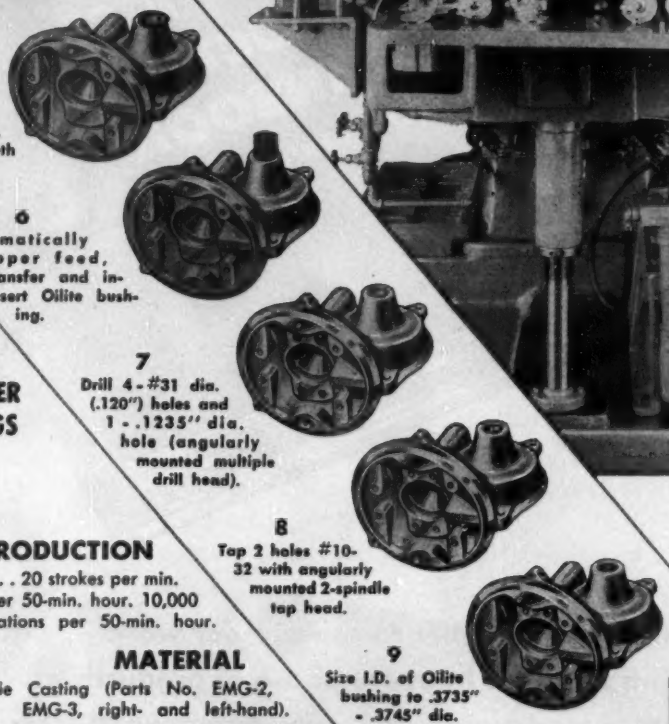


MINSTER

FIRST IN **PRESS** DESIGN

Bodine CASE HISTORY NO. 37





5
Spot face ⅛" dia. maintaining depth to ± .002".

6
Automatically hopper feed, transfer and insert Oilite bushing.

7
Drill 4 - #31 dia. (.120") holes and 1 - .1235" dia. hole (angularly mounted multiple drill head).

8
Tap 2 holes #10-32 with angularly mounted 2-spindle tap head.

9
Size I.D. of Oilite bushing to .3735" - .3745" dia.

PROCESSING WINDSHIELD WIPER MOTOR HOUSINGS

PRODUCTION

One piece per stroke . . . 20 strokes per min. — 1000 pieces per 50-min. hour. 10,000 individual operations per 50-min. hour.

MATERIAL

S.A.E. #925 Die Casting (Parts No. EMG-2, EMG-3, right- and left-hand).

TOLERANCES

(Other than specified above) Drilled holes: Size .001". Location: ± .002". Tapped holes: Class 2 threads.

MACHINE

Bodine Model 42-30 Drilling, Tapping, Assembling Machine. Write us for Bodine Brochure AM-5, "12 Case Histories."

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools."

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT

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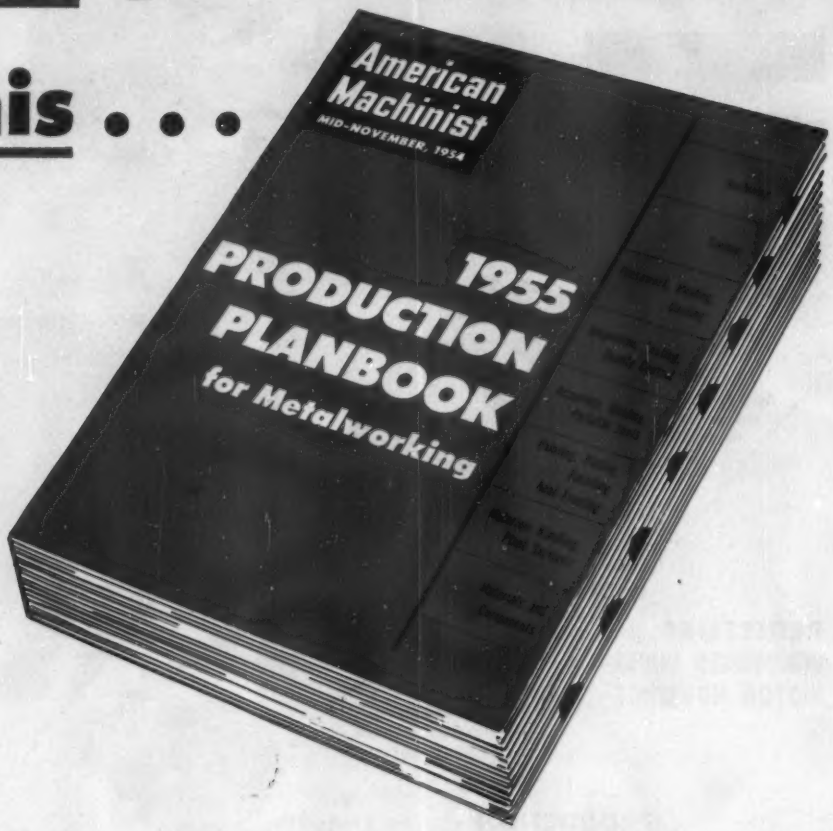
the busier you are, the more you'll benefit from this . . .



. . . and it's coming in November to speed your work . . . guide you quickly to problem solutions in every phase of production . . . increase the long-time, repeated value of every *American Machinist* issue.

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Does this description fit you:
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It fits most *American Machinist* readers . . . and the closer it comes to fitting *you*, the more helpful you'll find the 1955 PRODUCTION PLANBOOK. To a greater extent than any other issue of a magazine yet published, this PRODUCTION PLANBOOK will *help you* solve a great variety of production problems much *faster* than they could be solved otherwise.

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Have you a problem in machining . . . tooling . . . heat-treating . . . welding . . . materials handling . . . stamping . . . inspection . . . quality control . . . lubricants? Chances are you'll find a clue, at least, to the answer you want in the PRODUCTION PLANBOOK. And once you've found it, this great issue will guide you to the detailed facts you want . . . because every idea in the PRODUCTION PLANBOOK has been more fully explained in one or more regular issues of *American Machinist* . . . and the PRODUCTION PLANBOOK will tell you when and where.

It's difficult, really, to tell you *exactly* what this great issue *will* be like. You will have to see it and *use* it before you will really know how much it can do to save your time and increase the efficiency of your production operations. But think of it, now, as the kind of reference file you'd make up for yourself if you had the time, resources, and help to do so . . . and watch these pages for further information about your PRODUCTION PLANBOOK issue of *American Machinist*. We plan to bring you further facts regularly between now and November.

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McGraw-Hill Building, New York 36, N.Y.

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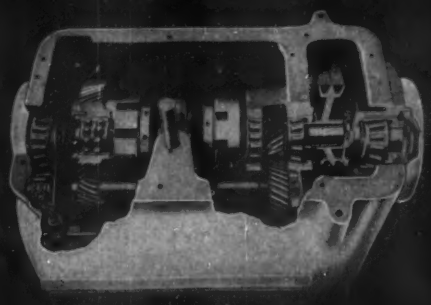

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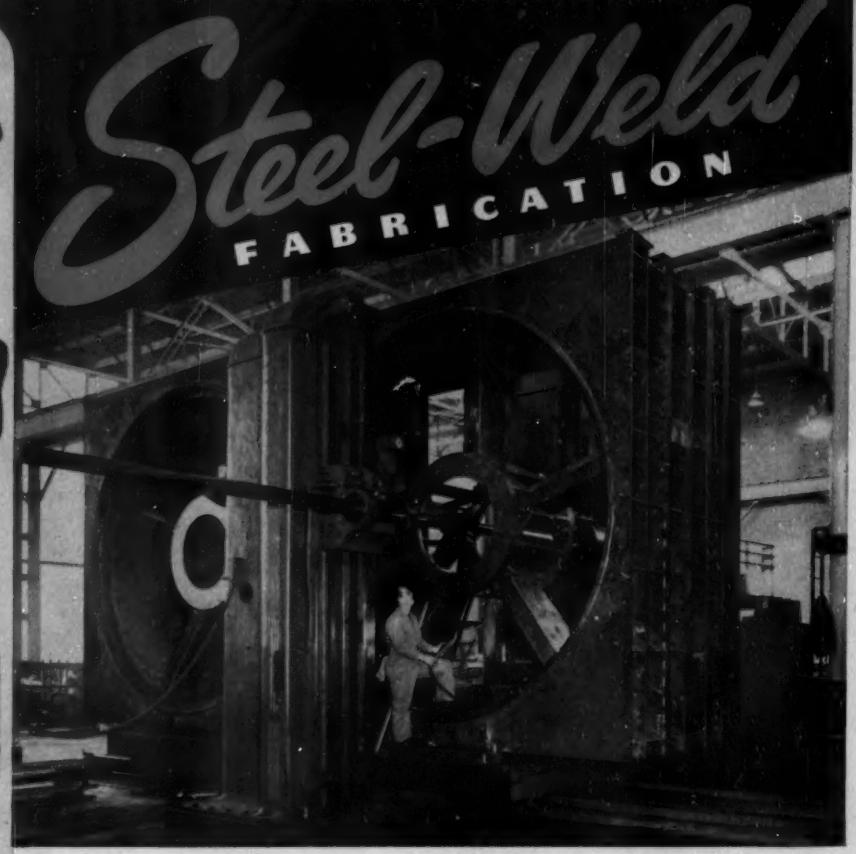
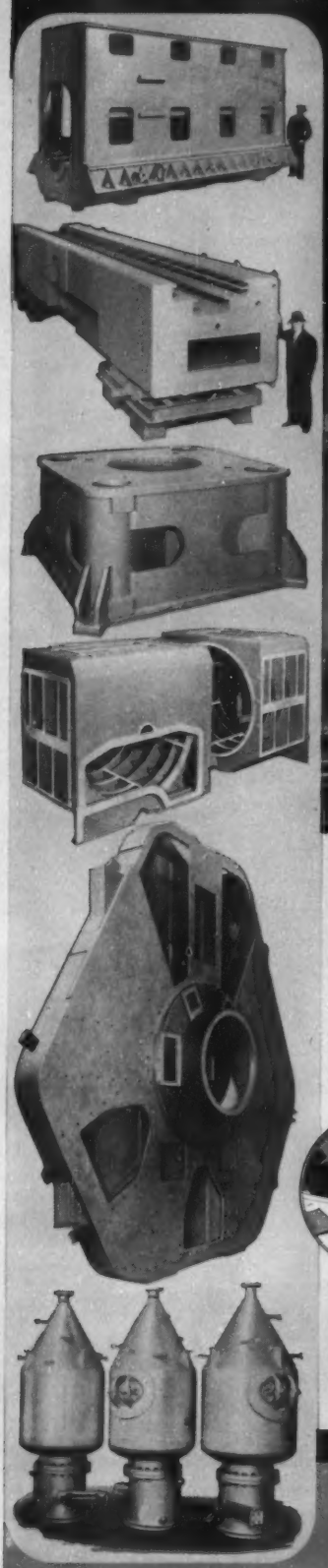
Scott Industrial Wipers—Another Scott Product that is changing America's way of doing things.

Steel-Weld FABRICATION





Use WELDED STEEL for Greater Strength with Less Weight!

The two Steel-Weld Fabricated propeller and engine mount sections for wind tunnels, illustrated above, and the parts and assemblies shown at the left, are typical of thousands of Steel-Weld Fabricated units produced and machined by Mahon for hundreds of manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. Perhaps you, too, should discuss this service with a Mahon engineer? If you require parts or assemblies including large, heavy pieces, where time and pattern costs are a consideration, Steel-Weld Fabrication may be the answer. You can turn to Mahon with confidence . . . personnel and facilities are available within the Mahon plant to do the complete job from drawing board to finished machining. You will find in the Mahon organization a unique source with complete ultramodern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or have a Mahon engineer call and give you complete information.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

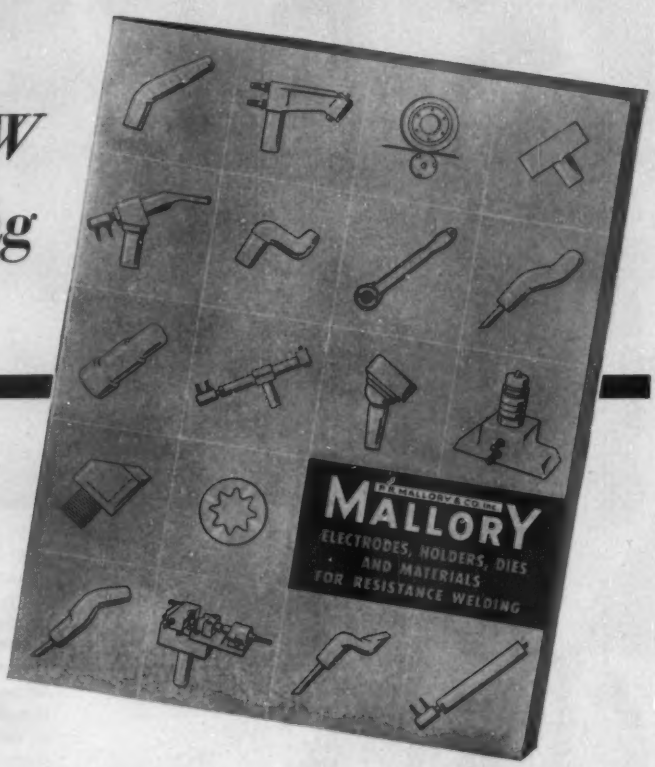
Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

Save the time and cost of "specials" by checking Mallory standard stock

Many of the resistance welding electrodes, holders and accessories that you've been considering as "special" are probably standard, stock items for Mallory. Get acquainted with the varied line of welding supplies available from Mallory; you'll save the extra cost of many custom-made items, and you'll get prompt deliveries from warehouse stocks.

Write for this NEW Resistance Welding Catalog



Anyone concerned with the specifying or purchasing of welding materials will find the new Mallory catalog a valuable reference source. It covers the complete list of all Mallory electrodes, seam welding wheels, holders, forgings, dies and materials . . . all grouped in easy-to-use sectional arrangement. Included for the first time are full specifications for heavy duty "Nu-Twist" and "Premium" holders, and expanded data on welding dies. A simplified coding system is used for identifying the many types of bent electrodes. All Mallory distributors are listed.

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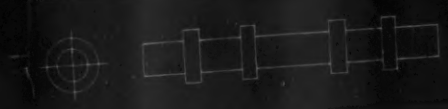


Turning

Tool tips on multiple-tool setup, turning SAE 1050 axles in as-forged condition. Best competitive steel: 6 to 7 axles per grind per set. VASCO SUPREME gives 15 axles per grind per set of tools on same job.

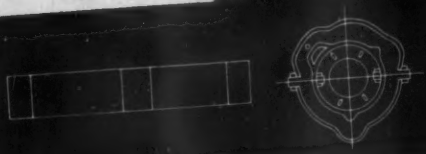
Boring

Boring bits, on axle hole of SAE 1060 car wheels, as forged, hardness BHN 255. Competitive steels gave 20 wheels per grind. VASCO SUPREME averages 40 wheels per grind on this assignment.

for supreme performance in high speed steels

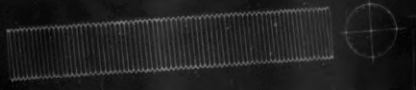
specify and use

VASCO SUPREME



Milling

Shell end mills, on 30″ diameter cams for carpet looms. Regular high speed steels produced 6 cams on first grind—gave 1 to 2 regrinds. VASCO SUPREME produces 14 cams on first grind, permits 3 regrinds before too small.



Threading

A unique job for a unique steel. Glass pulling roll 16 feet long, Rockwell "C" hardness 66-68, required highly-polished finished thread (28/inch) throughout length, with diameter tolerance of .0005″. VASCO SUPREME tool cut thread 2605 feet long without regrinding, to tolerance of .0005″—one of the most remarkable performances ever recorded.

These instances of SUPREME cutting efficiency, taken at random from current report files, typify the unparalleled service to industry provided by this extraordinary High Speed Steel. VASCO SUPREME will do work no other high speed steel will do. It is often used with cemented carbide tools—and at far less cost. And there are applications where *only* VASCO SUPREME's unique combination of strength and toughness will do the job as it should be done. *Write us about your present needs.*

VANADIUM-ALLOYS STEEL COMPANY

Manufacturers of First Quality Tool and Die Steels

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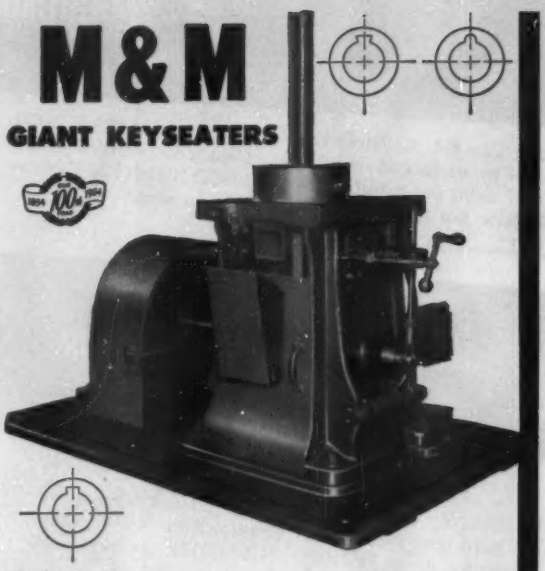

M & M Giant Keyseaters, built in a wide range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems today.

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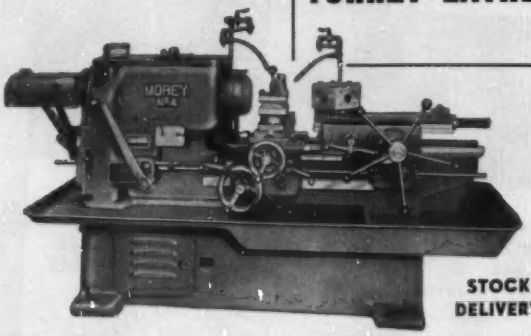
Simplified Operation
for Greater Production

MOREY
No. 4 Universal
TURRET LATHE



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Designed to take advantage of tungsten carbide tools, the modern MOREY Turret Lathes are ruggedly and heavily built for continuous duty, maintaining close tolerances. New methods of speed and feed control are incorporated, permitting even the inexperienced operator to select almost instantaneously the speed and feed best suited to the work . . . Ideal for both bar and chucking operations.

PARTIAL SPECIFICATIONS

Bar work capacity	2" x 12"
Chucking capacity	2"
Swing over bed	19¼"
Hole through spindle	2 13/32"
Spindle speeds (back gear ratio). From 35 to 1500 RPM	
Infinite variations with constant speed, A. C. 1200 RPM motor 12:2	
Motor	7½ HP

Supplied with hardened steel bedways.
For full details write to Dept. A-3

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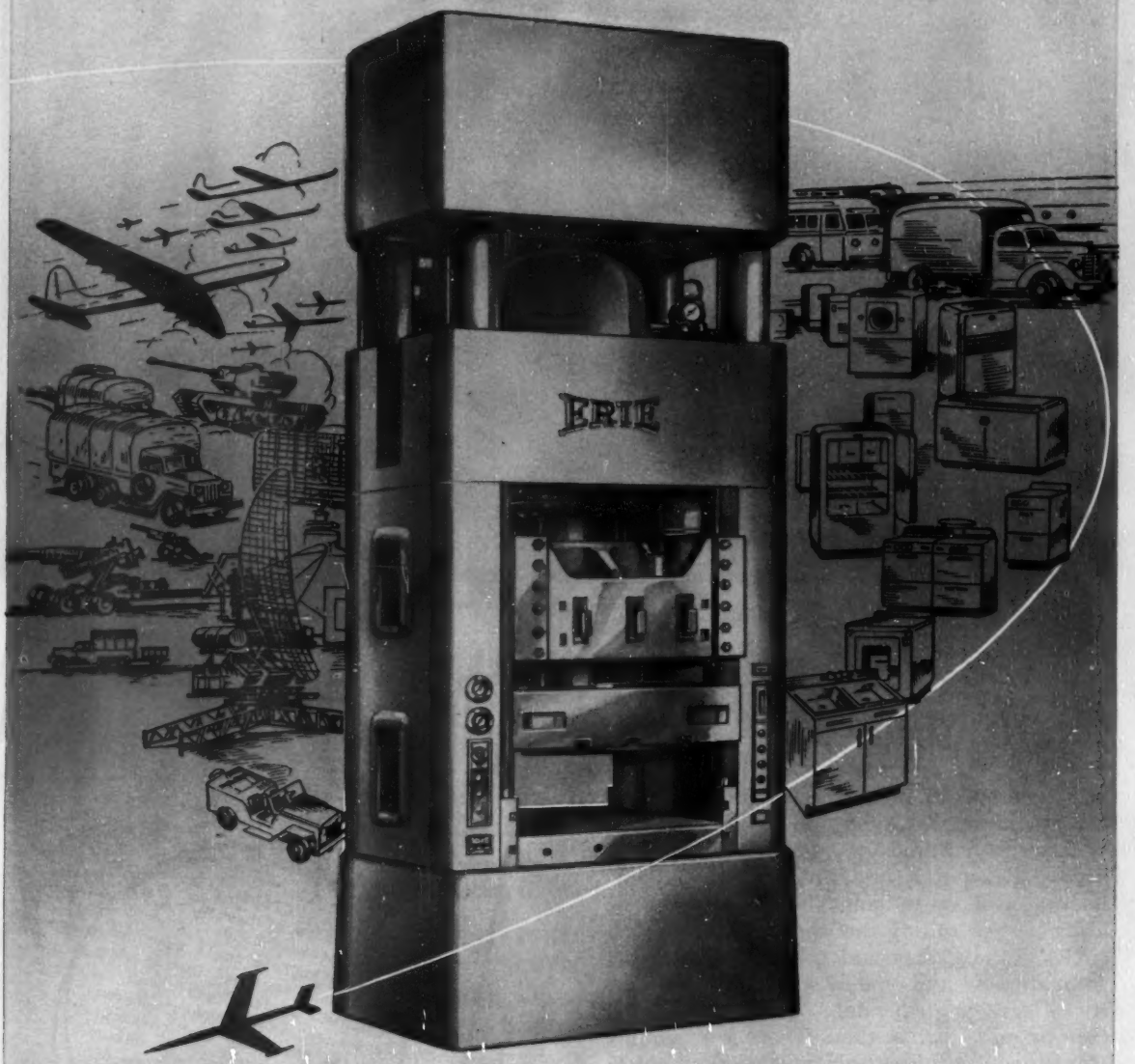

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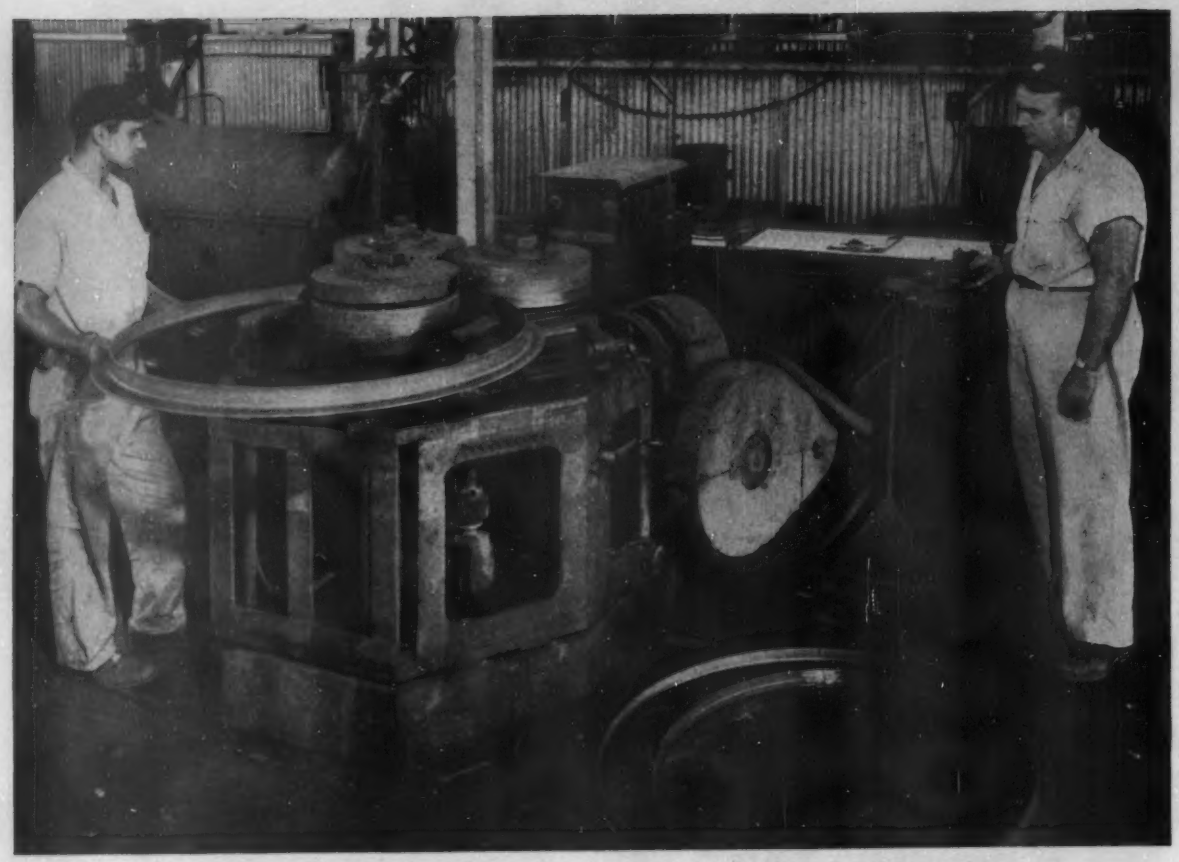

"Buffalo" No. 2 Bending Roll turning out angle rings at Bushnell Steel Works, Tampa, Fla.

"BUFFALO" BENDING ROLLS WILL BRING NEW BUSINESS INTO YOUR SHOP, TOO

If you've had to turn away or job out metal bending business, why not do as Bushnell Steel Works and hundreds of other top-notch shops have done—put a high-production "Buffalo" Bending Roll on the job. These easy-to-operate machines are rolling out commercially perfect circles, spirals, arcs and other curved shapes from almost every type of structural—even the tricky leg-in angle bending—faster and cheaper than by any other method. There is a bending roll for your requirements whether for light or heavy work. Write for Bulletins 3344-A and 352-B, and look into this profitable way of bending.

As another item of probable interest to you, the No. 2 Buffalo Angle Bending Roll has developed into a most valuable piece of equipment. As you know, we were rather reluctant to invest in that particular machine. However, it has brought in a considerable volume of profitable work that we could not otherwise have handled.

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NOW Clutch Operated Models

extend the applications for

Swanson TURRET INDEXING UNITS

Swanson Series TC Unit shown with optional mounting brackets.

By providing a "packaged" intermittent-motion chassis, Swanson Turret Indexing Units save time and money in designing and building special automatic machines for precision production operations on small and medium parts.

SWANSON series TC indexing turrets differ basically from the accepted series T units only in the solenoid-operated clutch drive provided. They incorporate the same Swanson cross-over cam and locking device to assure harmonious indexing and accurate, positive positioning at all work stations. They are available in a wide range of turret diameters and work stations, with full provision for mounting operational devices of all types.

The new clutch-operated models have been developed to handle applications requiring a high variable of infinite work cycles . . . or where it is desirable to have the operator control the indexing cycles by push-button controls. Limit switches may also be provided to prevent indexing before completion of any operation cycle. Without obligation, Swanson engineers will be glad to suggest applications of these units and accessories to you. In over a third of a century, Swanson-made machines have improved quality and quantity in hundreds of manufacturing operations.

Write for Bulletin TC1

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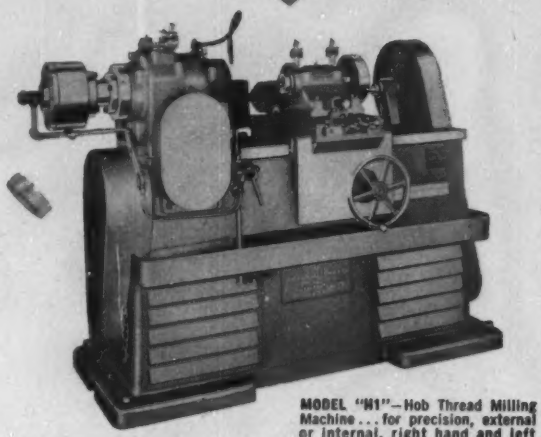

MODEL "H1"—Hob Thread Milling Machine . . . for precision, external or internal, right hand and left hand threads . . . AUTOMATICALLY!

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Without obligation, consult our engineering staff with your specific threading problems. Catalog and machine specifications available upon request.

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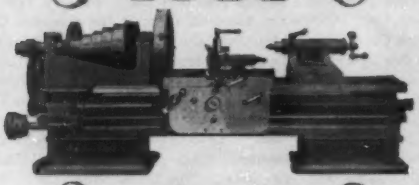

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. . . In that year the Boyé & Emmes design featured a single back gear, which doubled the number of spindle speeds previously considered adequate.

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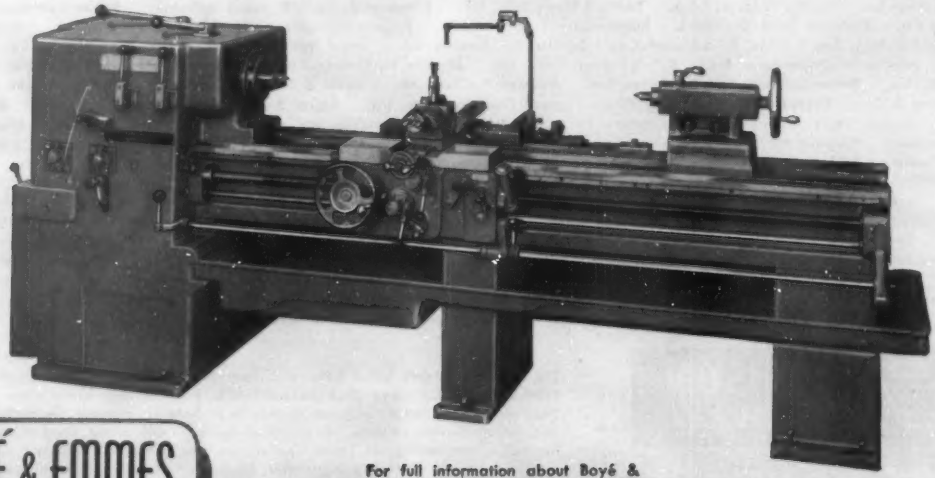

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Eye Patch Reminder:

Workers' Eyes Are Still Costly on the "Commodity Price Index" This Year!

The commodity price index may show a declining curve but the cost of industrial eye accidents remains as high as ever. The *hidden* costs* may not appear on the books but the direct costs alone in compensation, higher insurance rates and medical expense can make a high break-even point even higher. They justify *your action!*

Eye injuries cost more than $5.00 *per employed* worker, and more than 98% of the injuries are prevented when *exposed* workers wear safety goggles — at an average cost of $2.30. Where else in industry can you find an equipment investment that pays off as handsomely?

Ask an AO Safety Representative what other companies in and out of your industry have saved with an AO Program. Or write American Optical Company, 4135 Vision Park, Southbridge, Massachusetts, for booklet, "Improved Industrial Vision." Do it today.

**Hidden costs include:* Lost man hours • Idle time of worker's machine • Lowered efficiency because of substitute workers (Green men don't have the skill) • Cost of increased rejects.

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WHY IT PAYS TO BUY USS CARILLOY FC STEEL

"THIS FC STEEL cuts just like butter!" this machinist said. He finds that the free-cutting nature of Carilloy FC is especially helpful in producing intricate worm shafts. These shafts, which must be free of distortion and concentric from top to bottom, are made from USS Carilloy FC steel without heat treatment after machining.

Cuts costs 25% in heavy-duty gears and pinions!

• No heat treating, no grinding, no sand blasting after machining. Pittsburgh Gear Company, Neville Island, Pittsburgh, Pa., eliminated all three of these costly operations by switching from AISI 4140 to *pre-hardened, free-cutting* Carilloy FC steel. This was possible, because FC steel machines easily without distortion and requires no heat treatment after machining. It comes from the mill *ready to use.*

Carilloy FC helped this manufacturer to speed up production, too. He uses deeper feeds and faster cutting speeds than before, yet his tools last longer. All told, the change-over to Carilloy FC steel has lopped 25% off his production costs . . . at no loss in performance of the finished parts. His shafts, pinions, gears, and spacers, which are used in rugged industrial and mining machines, are just as strong and durable as they were before.

Carilloy FC steel is available annealed, or quenched and tempered to any hardness from 255 to 375 Brinell . . . with a tensile strength from 125,000 to 175,000 psi . . . in all standard bar forms and sizes. Ask the United States Steel Supply salesman about it. Or get in touch with our nearest warehouse.

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• Setup, operation and inspection are simplified because many parts are easier clamped on a vertical machine as compared to mounting against an angle plate on a horizontal machine.

• All controls are in a single panel, movable to the most convenient location—front, back and sides. Operator can control table and spindle without ever changing his position.

• Infinitely variable spindle speeds and feeds. Non-gear, easily maintained direct drives provide unusual smoothness of operation.

• 35" throat capacity—every practical safety control for machine, job and operator protection—unusually heavy construction—and a dozen other exclusive features.

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Buck Chucks ideal for grinders

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ALSO SUPER-GRIP 2-JAW INDEPENDENT CHUCKS FOR 9" to 16" LATHES.

Grinding the diameter and face of a centerless carbide tipped end mill — within plus .0000", minus .0005" — on a 5" Buck chuck is shown at the Brubaker Tool Corp., Millersburg, Pa.

THEIR REPORT: *"The chucking of various diameters to close tolerance is expedited with the Buck Ajust-Tru chuck. By limiting the indicator truing and chucking necessary with the old line chucks, we save 10% to 20% in production time."*

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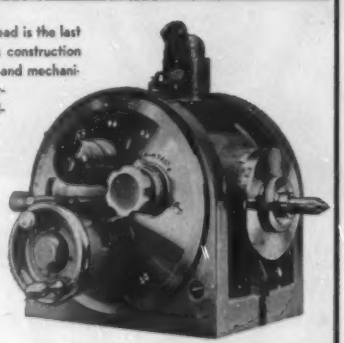
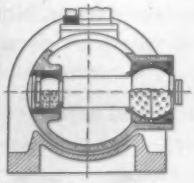
The LEITZ Optical Dividing Head is the last word in indexing precision. Its construction is different from other optical and mechanical dividing heads on the market. A NEW DOUBLE SPHERICAL BALL BEARING, DOUBLE READING IN THE SAME EYEPIECE 180° APART, motor drive attachment and other features make the LEITZ an important aid required in any shop where precision is demanded.





The 2 spherical ends of the spindle are carried in hardened steel cups with several hundred small precision balls held in place by ball cages in such a way that each ball creates its own path. There is no play, either radially or axially, no oil film, no wear and a very large load capacity.

Write for Descriptive Bulletin

Geo. SCHERR OPTICAL TOOLS, Inc.

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SIGOURNEY

M-100

THE PRECISION BENCH DRILLING MACHINE

ACCURATE because table and column exactly squared one to the other.

LONG LIFE because of hardened and ground spindles.

SAFE because motor, driving belt and spindles are entirely enclosed.

STRONG, RIGID for maintained accuracy.

SMOOTH AT HIGH SPEEDS — sealed ball bearings throughout for smooth operation from 4000 R. P. M. to 10,000 R. P. M.

MODELS — with 1, 2, 3 and 4 spindles.

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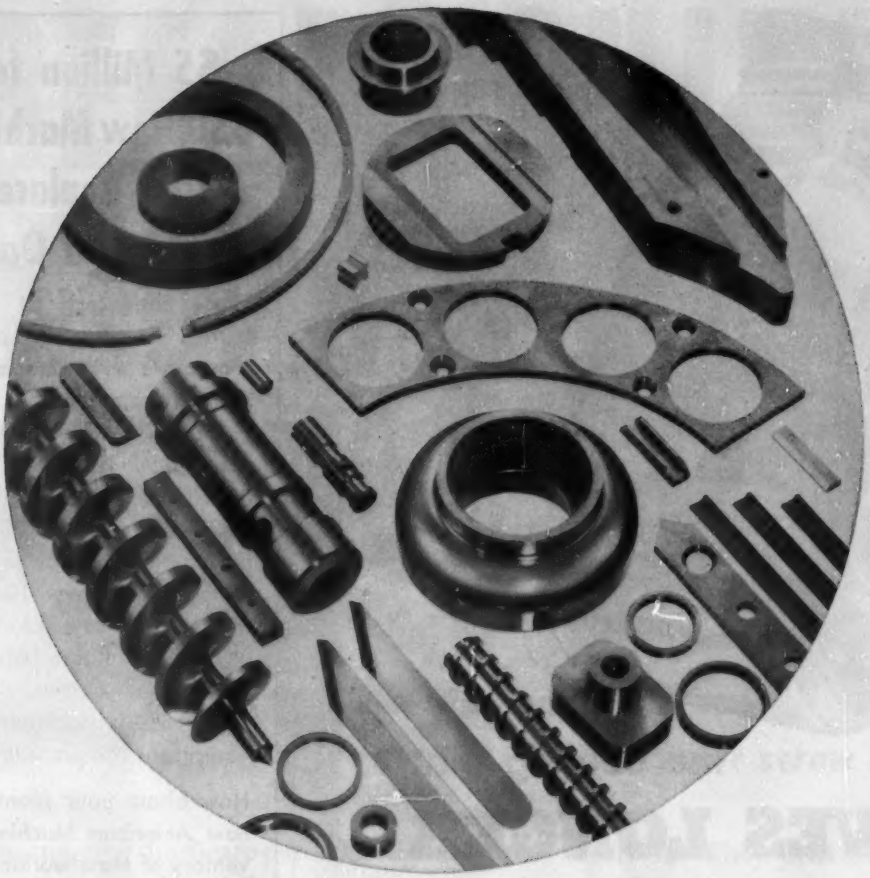

Some typical parts produced from HAYNES *alloys*

Custom Tailored to cut maintenance costs

Alloys for Every Wear Condition Shaped to Your Specifications

HAYNES alloys are available in a wide range of properties. They can be supplied as castings, forgings, stampings, or fabricated parts finished to close tolerances and with a mirror-like finish where required.

Some HAYNES alloys are extremely hard—to resist severe abrasion. Some are tough and ductile, designed for use where mechanical shock or repeated stress cause ordinary metal parts to crack and splinter. Some resist the corrosive action of acids, alkalies, and molten metals. Erosion from steam or liquids, the softening effects of high-temperatures, seizing and galling from metal to metal contact, are other severe conditions that can be effectively controlled through the use of HAYNES alloys.

Send us a blueprint of one of your wearing parts and tell us about the conditions under which the part must operate. We are sure we can supply you with a HAYNES alloy part "custom tailored" to solve your problem.

"Haynes" is a registered trade-mark of Union Carbide and Carbon Corporation.

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HAYNES STELLITE COMPANY

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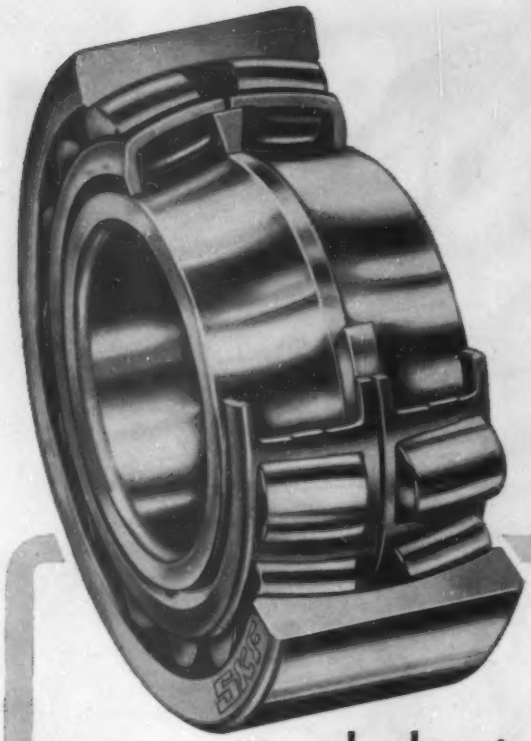

the bearing that

LIVES LONGER

comes from SKF

For your next replacement job, why not buy the spherical roller bearing that will *last* up to 3½ times longer than any other available design?

That's right—SKF's *improved* (Type "C") Spherical Roller Bearing *will* provide, size for size, 2 to 3½ times more life, and up to 50% increased capacity . . . *at no increase in cost.*

Your nearby SKF Distributor can show you how the original SKF Spherical design has been improved to reach this higher performance level, and, in the most popular series, can supply your requirements promptly from his stock. Remember—your SKF Distributor is a trained specialist in helping industry *put the right bearing in the right place.* **SKF INDUSTRIES, INC.,** PHILADELPHIA 32, PA.— *manufacturers of* **SKF** *and* HESS-BRIGHT® *bearings.*

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SKF®

BALL AND ROLLER BEARINGS

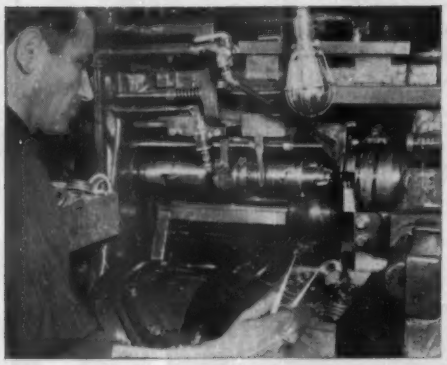
$5 Million for 850 New Machines That Replaced 1743 Old Ones

That's the story at Saco-Lowell. And the facts on this company's 5-year modernization program are only a few of the thousands you'll find in the 1954 PRODUCTION PLANBOOK for Metalworking. Now — when 55% of metalworking machine tools generally are over 10 years of age, Saco-Lowell faces the competitive future with the production efficiency that only modern machinery and equipment can provide.

How about your plant? The new *American Machinist* Inventory of Metalworking Production Equipment, featured in your new PLANBOOK, enables you to compare the efficiency of your shop with Metalworking throughout the U.S. The Inventory tells *how much* machinery and equipment is in use, *where* it is, and *how old* it is. In addition, there are hundreds of pages of authoritative, money-saving data to guide you in modernizing, including hundreds of actual case histories showing you exactly what *can and has been done* in successful replacement programs in metalworking plants.

The PRODUCTION PLANBOOK for Metalworking
is published every November by
American Machinist

FREE-MACHINING ENDURO STAINLESS STEEL BARS



Put parts in the pan 90% as fast as Bessemer screw stock

You can give duplicate parts the high physical and chemical properties of stainless steel. And, you can do it without a heavy production penalty!

Simply set up and run Free-Machining ENDURO Stainless Steel Bars. They'll respond beautifully at every station on your automatics. Two grades are fully 90% as machinable as Bessemer screw stock.

These high-quality bars are cold-finished by Republic's Union Drawn Steel Division. They provide close tolerance, accuracy of section, uniform soundness, and fine surface finish.

Free-Machining ENDURO also is available in hot-rolled bars and in wire. Republic metallurgists and machining advisers are ready to help you apply ENDURO every step of the way. Just write:

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Export Department: Chrysler Building, New York 17, N. Y.

NEW! 96-page pocket size booklet, "How To Machine Republic ENDURO Stainless Steel Bars." Packed with machining tips, tables of feeds and speeds, stainless steel properties, other vital information. Write Republic. Ask for ADV-607. FREE!

REPUBLIC ENDURO FREE-MACHINING STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Bars, Wire, Pig Iron, Steel and Plastic Pipe, Bolts and Nuts, Tubing

DRY SMALL PARTS QUICKLY and ECONOMICALLY with BARRETT CYCLONE CENTRIFUGAL DRYERS

The Barrett Centrifugal Dryer — efficient, self-contained, and compact is built in several sizes.

The Barrett Parts Drying Process centers around a method of creating a guarded cyclone.

In operation, parts to be dried are placed in a well ventilated motor driven rotating basket. Free liquid is immediately thrown off by centrifugal force and any moisture remaining on parts is absorbed in the shortest possible time by the large volume of expanded air continually forced over and through the contents. Provision is made for heating and expanding, also boosting the flow of incoming air to assure faster absorption of moisture. With the large exhauster provided, heated air is not always required.

Direction of basket rotation can be quickly reversed which will change position of the load and accelerate drying. Baskets are available in shapes which experience has shown to be most effective for handling various classes of work.

It will pay to investigate the advantages offered by Barrett Centrifugal Dryers on your work.

Full Details of the Barrett Cyclone Dryer Sent Promptly on Request.

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Designers and Builders of Centrifugal Machinery

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

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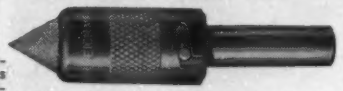
TELEPHONE: JAMAICA 6-4090

Abrasive Cent-R-Lap Tool



Saves time, eliminates diamond dressing. Cones changed in seconds. Available in 2 sizes, ⅜" and ¾" Cent-R-Laps and abrasive cones in leading grits. Write for descriptive literature and prices.

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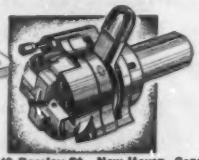
H&C Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

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. . . for precision work

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The cylindrical plungers in the Waltham Sub-Presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

Overhang

WALTHAM MACHINE WORKS
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"IMPOSSIBLE" TAPPING PROBLEM

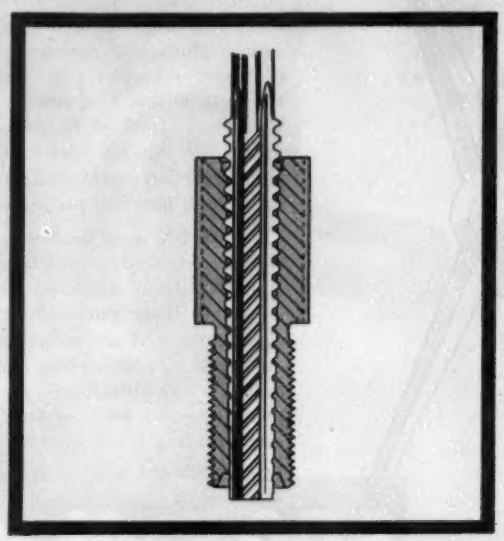
SOLVED

BY R/N ENGINEERING

5/16-14 QUADRUPLE ACME THREAD TAPPED THROUGH 2" BERYLLIUM COPPER WITH REDUCED TOOLING AND MANUFACTURING COSTS

Airborne Accessories Corp., Hillside, New Jersey, required a tap for a 5/16-14 quadruple Acme thread through two inches of an intricate beryllium copper part used on an actuator on the flight control system of F7U-3 Vought Cutlass airplanes. To solve the difficulties presented by the tough material, the quadruple thread, and space limitations, R/N engineers suggested a design modification that retained the lateral stability required, but permitted a thread of machinable proportions.

Engineering aid like this, resulting in great savings in tooling and production, is one of Reiff & Nestor's services beyond the manufacture of highest quality taps. Such services help many users to recognize the value of specifying R/N taps.



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LYKENS 2, PENNSYLVANIA

Specialists in Tap Manufacture Since 1911

For complete data on R/N service and taps, write for the new R/N Catalog and Price list.

CUT OFF TABLE BELOW FOR READY REFERENCE...

Also . . . *Special taps immediately available from R/N stock:* **HIGH SPEED–GROUND THREAD**

MACHINE SCREW TAP SIZES			HAND TAP SIZES					
#00		96	¼	20-28	8-18-22-24-27-30-32-33-36-40-42-48-50-56-60-72-80	1 1/16		8-12-14-16-18-20-24
#0	80	64-72				1 1/8	6-12	5-8-10-12-14-16
#1	64-72	48-56	5/16	18-24	12-14-16-20-22-27-30-32-36-40-44-48-56-72	1 3/16		6-12-18-20-32
#2	56-64	48-80	3/8	16-24	9-12-14-18-20-26-27-28-32-36-40-46-48	1 1/4		5½-8-10-12-14-16-18-20-24-36
#3	48-56	36-40-44-52	7/16	14-20	12-16-24-27-28-30-32-40	1 5/16		8-10-12-16-18
#4	36-40-48	32-36-80-90	1/2	13-20	10-11-12-14-16-18-24-27-28-30-32-36-40	1 3/8		10-16-20-32-40
#5	40-44	32-36-48-60-64-72	9/16	12-18	14-16-20-24-27-28-30-37	1 7/16		5-8-10-11-12-14
#6	32-40	24-30-36-44-48-50-56-64	5/8	11-18	10-12-14-16-20-24-27-28-32-36-40-48	1 1/2		8-11-14-16-20
#7		30-32-36-40-44-48-64	3/4	10-16	12-14-20-24-27-28-30-32-40	2		6-8-10-12-14-16-18-20
#8	32-36	30-40-56-60	13/16		10-12-14-16-20-24-28-32	1/4		64-72
#9		24-30-32-36-40	7/8	9-14	8-10-12-13-16-18-20-28-40	5/32		48-50-80
#10	24-32	28-30-36-40-48-60	1	8-14	7-10-11-12-16-18-20-24-27-32	3/8		32-40-44-48
#12	24-28	20-32-36-40-48-56-60	1 1/16		12-14-16-18-20-32	7/32		24-28-32-36-40-48
#14	20-24	18-28-32-40	1 1/8	7-12	8-16-20-24-28-32	5/16		24-28-32-36-40
#16		18-20-22-28-32-36	1 3/16		10-12-14-18-20	9/32		24-28-30-32-36-40
#18		18-20-32-36	1 1/4	7-12	8-10-14-16-18-20-24	5/32		20-28-31-32-40
#20		16-18-20-32	1 5/16		12-14-16-24-26-32-36-40	11/32		20-24-28-32-40-48
#22		14-16-18	1 3/8	6-12	8-10-14-16-18-20	3/32		16-18-32

TELEPHONE: Reiff & Nestor Company at **LYKENS (PA.) 33**

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

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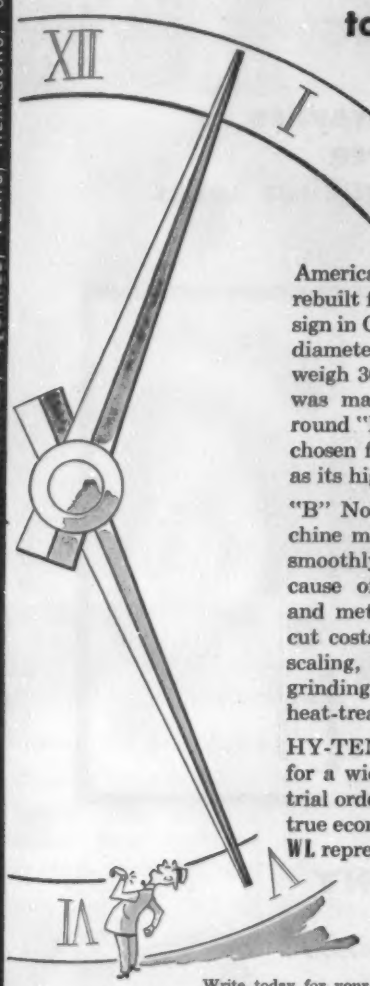
to Investigate the Qualities of HY-TEN ALLOY STEEL



America's largest clock was recently rebuilt for a spectacular illuminated sign in Chicago. It measures 50 ft. in diameter — hands and movement weigh 3000 lbs. The new driveshaft was made from 6 ft. of 3½-inch round "B" No. 3X heat-treated bar, chosen for its machinability as well as its high physical properties.

"B" No. 3X heat-treated bars machine more readily and finish more smoothly than standard alloys because of their particular analysis and method of manufacture. They cut costs by eliminating distortion, scaling, straightening — and often grinding — as well as the cost of heat-treating finished parts.

HY-TEN "B" No. 3X bars are used for a wide range of applications. A trial order will convince you of their true economy. Just call your nearest W-L representative.

Write today for your FREE COPIES of Wheelock, Lovejoy Data Sheets, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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Is Old, Tired Machinery and Equipment COSTING YOU MONEY?

If you have as much old and outmoded machinery in your shop as most metalworking plants have, your production efficiency is way below what it ought to be.

The new PRODUCTION PLANBOOK for Metalworking, which came to you in November as part of your regular *American Machinist* subscription, has the answers to questions like these:

- How old is the metalworking production equipment in use today? How much is in use, and where is it?
- How does *your* plant compare with the overall picture?
- Can *you* profit from modernization? Exactly when, and how? How have other companies done it?

The 1954 PLANBOOK, featuring a new *American Machinist* Inventory of Metalworking Production Equipment, is jam-packed with sound, usable, up-to-the-minute data on replacement and modernization of every type of machinery and equipment used in metalworking—*data available nowhere else.*

The PRODUCTION PLANBOOK for Metalworking

is published every November by

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EVEN THE BEST CAN BE IMPROVED

Gerotor offers its *New QDB* series of small capacity pumps as proof!

Gerotor has redesigned its series of small capacity pumps to give even more . . .

- **FLEXIBILITY**—the QDB can be operated in either clockwise or counterclockwise direction by simply changing the position of one internal plug!
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- **DEPENDABLE SERVICE**—the QDB is built to give more dependable service over a longer service span than any comparable pump. Its longer life reduces your maintenance and replacement costs.

If you have need for pumps in the QDB range, call on Gerotor.

Gerotor makes a complete line of hydraulic pumps in ranges from .4 g.p.m. to 40 g.p.m. The Gerotor engineers can help you solve your hydraulic pump problems. Write for *free literature* and full particulars.

Check this capacity table . . .

Type	Delivery g.p.m.—1800 r.p.m. Discharge Pressure p.s.i.				
	0	250	500	750	1000
QDB .4	.42	.40	.38	.35	.31
QDB .75	.84	.80	.78	.73	.66
QDB 1.5	1.67	1.62	1.57	1.50	1.42

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COUNTERSINKS *and* DEBURRING TOOLS

With Single Cutting Edge

Revolutionary! Chatterless!

• Greater ease in cutting is the outstanding feature of these new cutting tools—made for 82° angle countersinking and for 90° angle deburring operations. Have only a single cutting edge which prevents chatter. Both tools are regularly made for right hand cut. One trial will convince you. Special tools of this type made to order.

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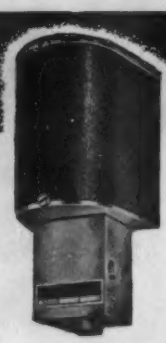
Solenoid VALVES



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3-WAY 4-WAY
For operating Master Valves and Small Cylinders

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Controls speed of Air and Hydraulic Cylinders

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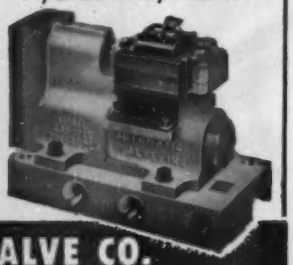

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WHEN TOOLING IS COSTLY GO V & O

Precision Power Presses and Feeds Since 1889

THE V & O PRESS CO. *Division of Emhart Mfg. Co.* HUDSON, N. Y.

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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Produced under License Issued by John Milton Luers Patents Inc.

W.H.O.* SAYS:

"Dont have FITS over FASTENERS, have fasteners that fit."

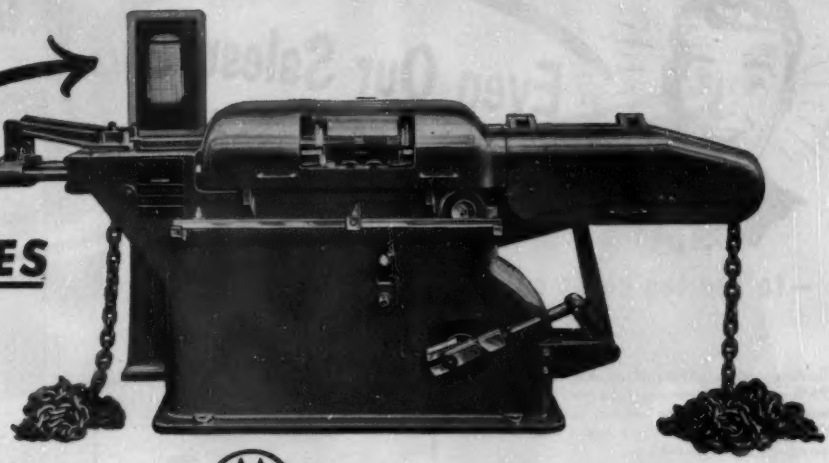
For the finest in milled-from-the-bar cap screws — set screws coupling bolts and milled studs

don't get stuck—stick to the ones made by

*Wm. H. Ottemiller Co. YORK, PENNA.

WHOEVER BUYS THIS CHAIN

CAN GET *this* CHART which PROVES the chain is good



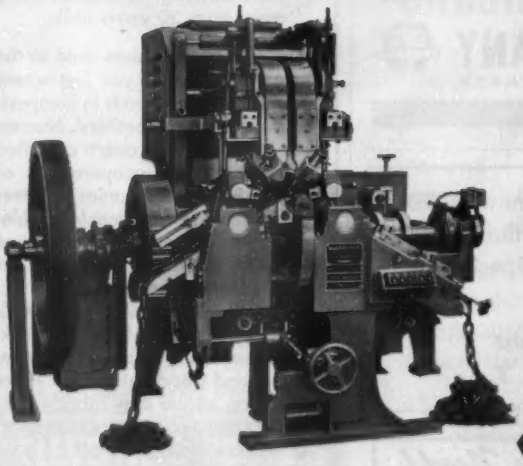
it was tested on a M R+P automatic tester

Meyer, Roth & Pastor chain testers do a more complete and accurate job than ever before. Depending on pitch and wire diameter, lengths of chain from 3 to 13 links can be tested at a time, and up to 45 lengths can be tested in one minute, automatically. Furthermore, for each length which meets tolerances, a continuous-line chart is produced which you can deliver with the chain as proof of thorough testing.

Here's how it works: each section of chain is stretched to a pre-determined length. The chart shows the tensile strain used to stretch each section. Those which stretch to the limit before minimum strain is applied are too weak—those which require strain over maximum have short links which weaken during testing. Both types, including those which break during tests, are rejected, and the machine stops automatically. However, sections which reach full length between mini and maxi strains are passed, and each one has the chart to prove it.

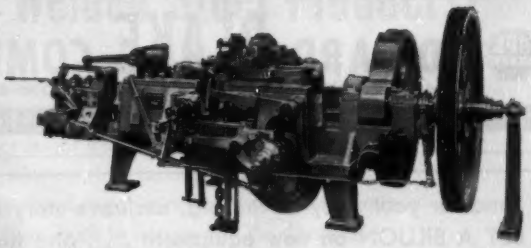
In addition to testing chain and recording results, this machine performs one other important operation: from each test-proved length of chain, one link is automatically stamped, either with your trademark or some other product identification.

AUTOMATIC CHAIN WELDING MACHINES



Automatic, mechanical control during welding provides excellent welds, even on alloy steel. Attachment shaves off burrs around complete diameter of each weld smoothly, automatically. 9 sturdy models. Capacities: wire stock up to 1 1/32" dia. Speeds: up to 85 links/min.

AUTOMATIC CHAIN BENDING MACHINES



Excellent for short or long links. Two-position bending (for wire diameters of 3/8" or more) prolongs tool life and reduces bending marks on links. 7 sturdy models. Capacities: wire stocks up to 1" dia. Speeds: up to 130 links/min.

WE'LL SEND CATALOGS ON ANY OR ALL OF THESE MACHINES, IF YOU WANT THEM

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Your source for all Precision Machine Tools— from Small Bench Lathes to Large Boring Mills

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—to see tap costs cut up to 75% with the BPS SYSTEM* "OF TAP SHARPENING"

Savings on tap costs of as much as 50 to 75%—and more—are routine for metalworking firms now using the B.P.S.* System. Why not join the leaders in your industry—and save?

THIS IS THE B.P.S.* SYSTEM:

Follow these two simple rules: (1) Sharpen your taps at *regular, planned* intervals and (2) Sharpen flutes and chamfers of taps to the exceptionally high degree of accuracy which is possible only on Blake grinders.

WHY THE B.P.S.* SYSTEM ALWAYS WORKS:

Using the Blake Chamfer Grinder and Blake Flute Grinder, your operators can sharpen each tap precisely to correct any error in indexing and to control the rake angle. Then each tap *must* cut much more accurately, more uniformly, with less strain—and its working life is greatly increased. Longer life, due to this superior sharpening method, greatly reduces tap costs — because every tap gives far more service!

*Blake Precision Sharpening

HERE'S WHAT THE B.P.S.* SYSTEM CAN DO FOR YOU!

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- Gives much more production per tap!
- Greatly reduces tap costs!
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- Over a million machine tools in America's metalworking industries are 10 years old or older. That is 55% of the total.
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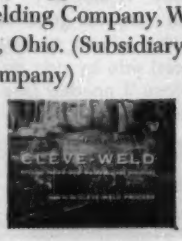
This illustrated brochure shows our facilities and describes what the Cleve-Weld Process is and does. Write for it.



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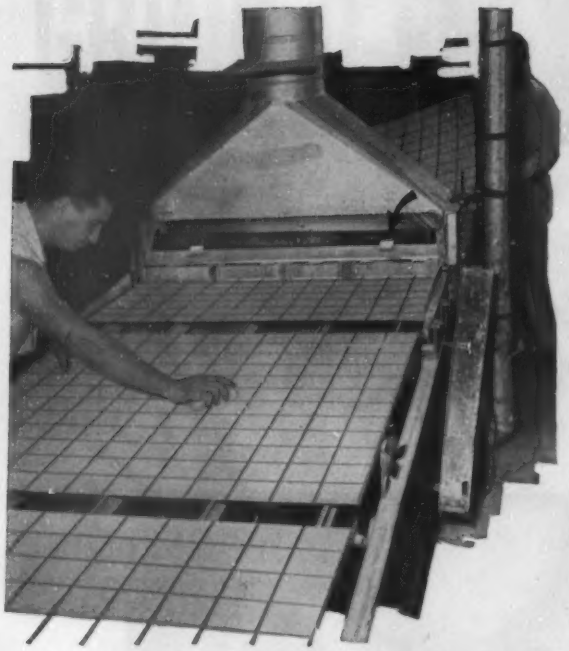

Operator sands down pips and rough spots before paneling passes between Pittsburgh brushes shown under exhaust hood.

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In producing wall and ceiling panels at the Barclay Manufacturing Co., New York City, dust caused by routing simulated "mortar lines" settles on the panels. The panels must be "dusted"—the dust *completely* removed—before they can be bake-finished.

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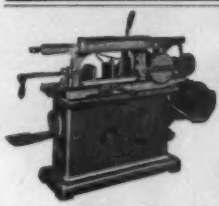

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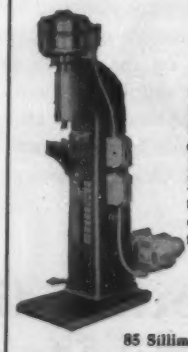

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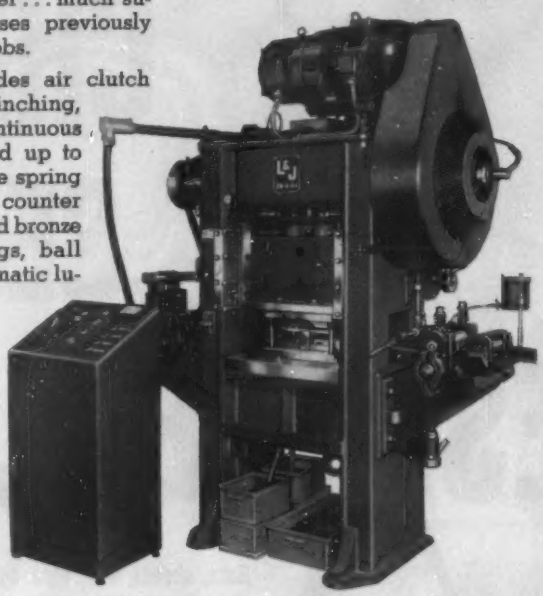

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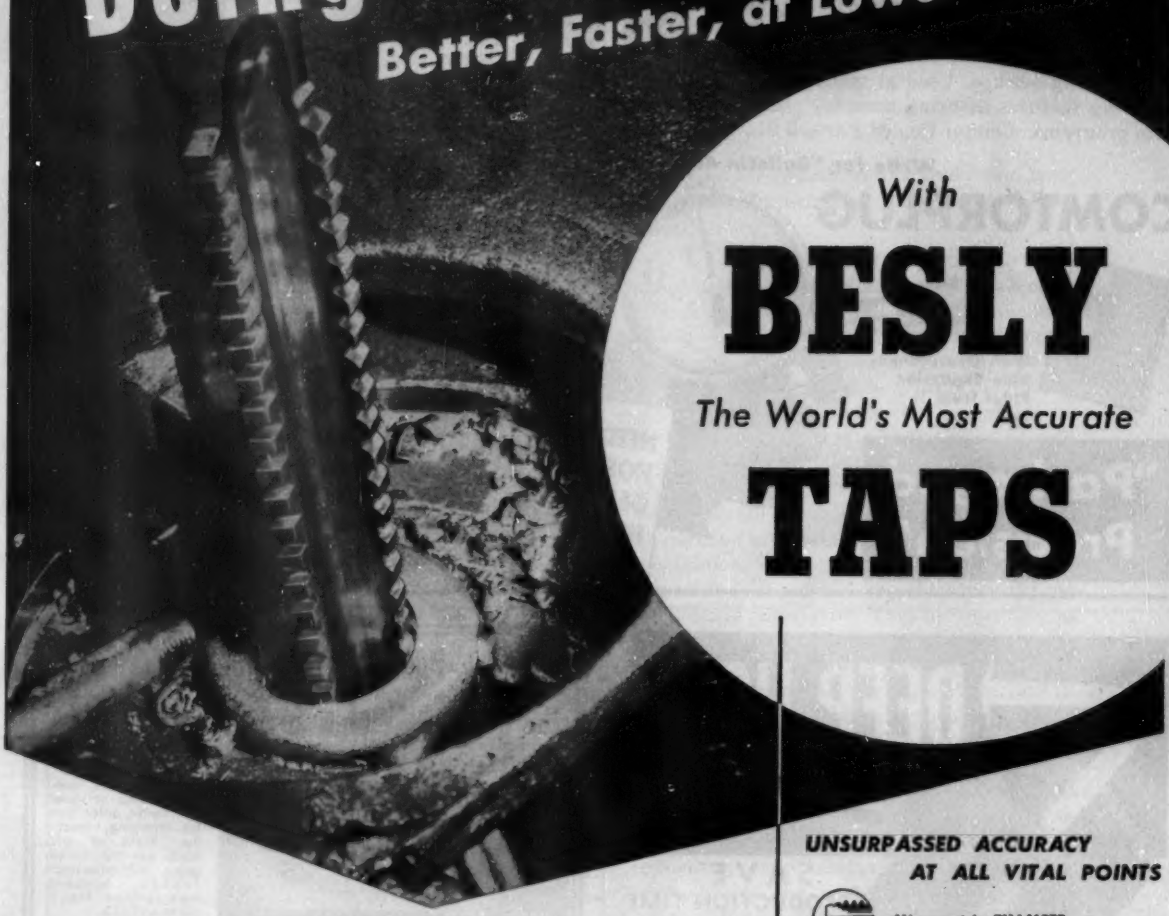

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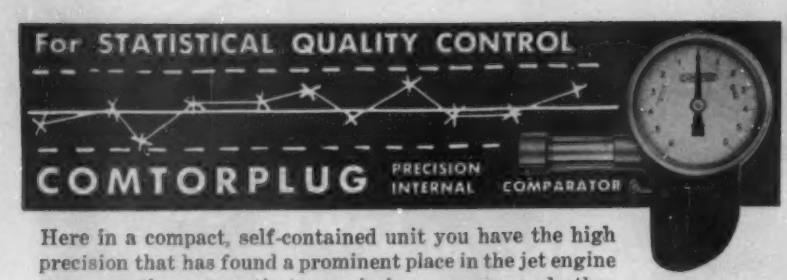

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The Audit Bureau of Circulations is a voluntary, non-profit, cooperative association. It was founded in 1914 and now consists of 3450 advertisers, advertising agencies and publishers in the United States and Canada. This magazine is proud to be a member.

ABC originally was set up to help take the racket out of publishing, to eliminate the waste and guesswork then so prevalent in publishing and advertising, to establish order and confidence in place of the misunderstanding and misrepresentation that arose from unverified circulation claims and dubious circulation practices. Its mission was to protect the interests of both readers and advertisers.

THIS IT DID by first defining the term "paid circulation." Then it established standards and rules to govern subscription sales practices and records. Finally it set up an auditing organization to verify the claims and report the facts concerning the circulation of each member publication. It now maintains on that job a working staff of sixty-five full-time auditors. So the ABC symbol has become the hallmark of circulation standards and advertising values. Each member publication must maintain those standards if it wishes to retain its membership and display the ABC symbol.

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IN DOING ITS JOB, ABC has created many values for both publishers and readers as well as for advertisers. That is because the publication that becomes a member of ABC thereby offers the strongest possible guarantee of its primary devotion to the interests of its readers. The function of a business magazine is to be useful to its readers. When this service is rendered by an ABC publication, it is constantly subject to the practical test of reader acceptance and approval. As each subscriber has the right to purchase or refrain from purchasing an ABC publication, that collective right confers upon the readers the power to say whether or not the publication will survive. Thus the report on its ABC audit provides the most direct assurance that a publication stays in business only because of a voluntary demand by readers who find its editorial service responsive to their needs.

Naturally, the editor of each business publication follows closely the score thus racked up by his paper in its ABC reports. In the scope and tone of his editorial coverage and treatment, in the selection and presentation of his editorial content, he must constantly labor to maintain and enhance the readers' acceptance of his efforts. That is why the editorial standards established by ABC publications set the editorial standards for all publishing. That is how the ABC constantly stimulates its member publications to become even more useful to their readers.

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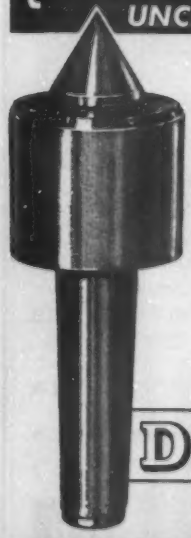

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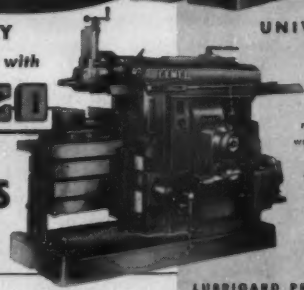

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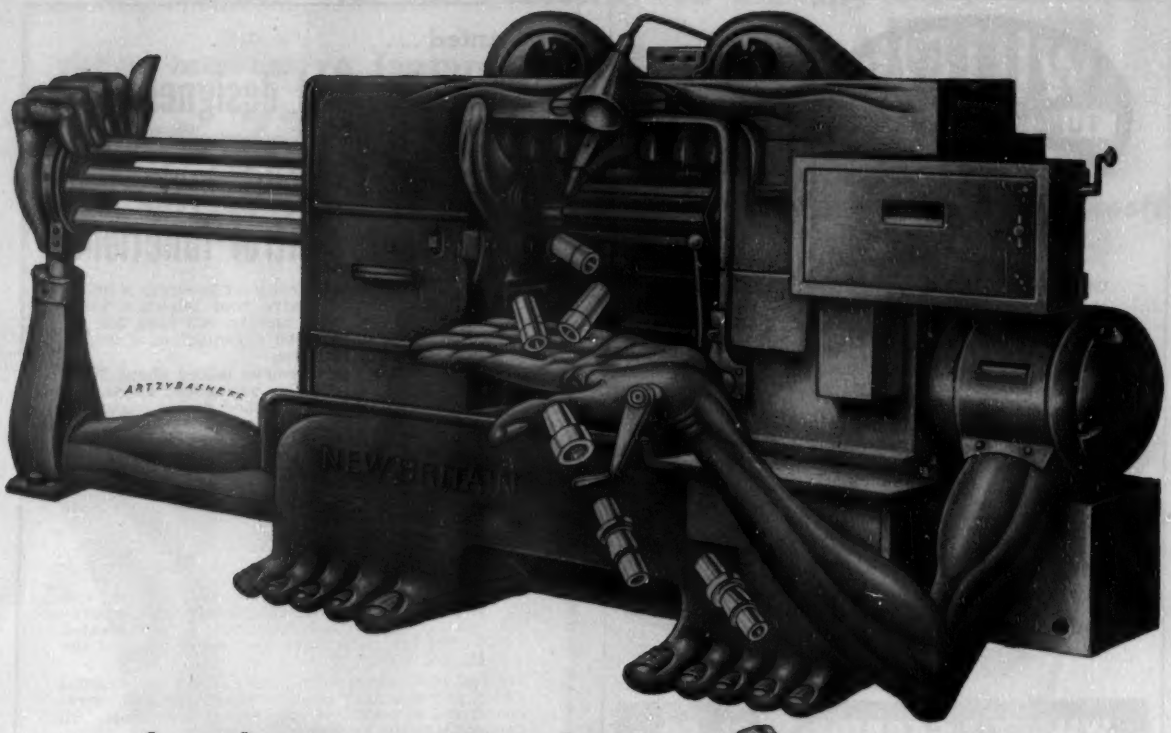
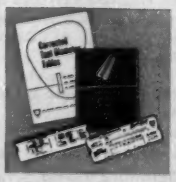


Look what you can do with Alcoa® Aluminum on your New Britain automatic screw machines

Carriers on New Britain automatic screw machines lift automatically during index to eliminate all wear on locating surfaces. Forming slides, mounted on large-diameter, hardened cylindrical studs preserve initial accuracy and permit fast forming advances.

With Alcoa Aluminum Screw Machine Stock, you can operate your New Britains at top feeds and speeds and get fine surface finishes with consistently uniform tolerances. You can lower your piece costs as much as one-third. You get three times as many parts from a pound of aluminum as from a pound of the heavier metals. Aluminum takes all finishes—resists corrosion—conducts electricity and heat exceptionally well.

Find out how aluminum can help you. Contact your local Alcoa sales engineer whose office is listed under "Aluminum" in the classified section of your telephone directory. Or write ALUMINUM COMPANY OF AMERICA, 874-E Alcoa Building, Pittsburgh 19, Pa.



PRODUCTION AND DESIGN ENGINEERS will want two Alcoa booklets, *Alcoa Aluminum in Automatic Screw Machines* and *Corrected Tool Diameter Tables*. Also available at no extra cost are two precision computers —a Speed-Feed calculator, and an alloy property guide which shows at a glance the various properties of Alcoa Aluminum Screw Machine Stock.

ALCOA ON TV brings the world to your armchair with "SEE IT NOW" featuring Edward R. Murrow, Tuesday evenings on most CBS-TV stations.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

WILLEY'S TUNGSTEN CARBIDE TOOLS

STANDARD TOOLS

Willey's—The COMPLETE LINE of cutting tools — made complete in our own factories. Hundreds of standard sizes always in stock.

SOLID TUNGSTEN CARBIDE REAMERS

SPECIAL TOOLS

Excellent service on special tools built to your specifications. Send us your prints. You will receive prompt acknowledgement, quotation and delivery date.

TIPPED TWIST DRILLS

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SOLID TUNGSTEN CARBIDE ROUTER BITS

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway — Detroit 1, Michigan

Wanted . . .

Machine tool designers

looking for real opportunity in

electrical circuit design and hydraulic control functions

In a rut where you are? Feel your progress is being blocked? Then why not give your talents a fresh start in a new, modern facility, working for an aggressive, highly respected organization, a leader in its field for over 50 years.

Here's the opportunity you've talked about. Now do something about it. The permanent expansion of our business demands qualified design engineers who can combine imagination and ability in the practical solution of machining problems (milling, drilling, boring, etc.)

There are 15 openings in this exceptional opportunity for advancement and for doing the things you like to do best — create and develop fine production machine tools. Excellent pay range commensurate with experience.

added benefits . . .

profit-sharing retirement benefits after two years service . . . liberal health insurance package . . . good labor relations . . . and located within the state that's the "Playground of the Middle West."

For full particulars write giving name, age, marital status and summary of experience. We will correspond and interview if application is suitable. All communications held strictly confidential.

P-2481, AMERICAN MACHINIST
520 N. Michigan Avenue — Chicago 11, Ill.

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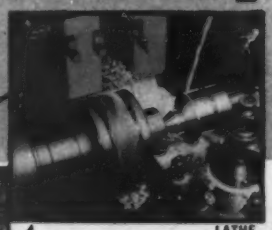

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AND BE SURE!

Red-E Precision CENTERS are the answer to all your turning and grinding ACCURACY problems.

Built to take weights up to 200 tons. Speeds to 4000 RPM.

Your ONE Source

for ALL Centers — over 200 models — Standards and Specials for Lathes, Grinding, Milling, Spinning, Turret, Screw Machining, Burnishing and Gear Cutting operations.

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CENTER *Specialists Since 1908*

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The use of clad materials is doubling and redoubling, owing to their many advantages in applications where corrosion resistance, or high thermal conductivity coupled with corrosion resistance is important.

"How to Work Clad Materials" is a fifteen-page *American Machinist* Special Report summarizing the latest practices in fabricating clad. All phases of fabrication are discussed, with the emphasis on welding, since there is a particular need for information in that area.

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Copies are available at 25 cents each

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AMERICAN MACHINIST

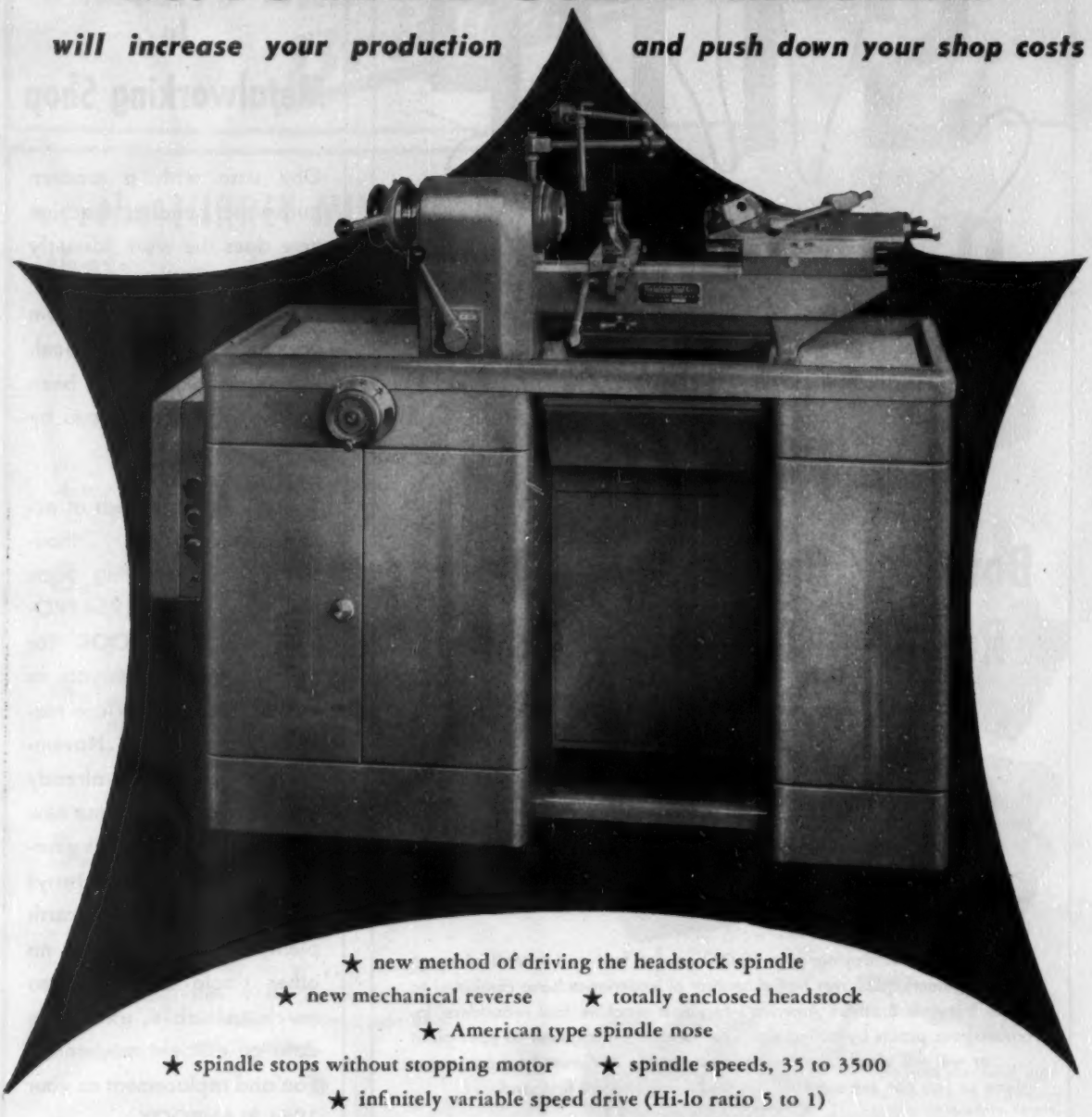
McGraw-Hill Building, New York 36, N. Y.

A "natural" for the ELECTRONICS Industry . . .

these impressive features on the brand new Wade

no. 73 HAND SCREW MACHINE

will increase your production and push down your shop costs



★ new method of driving the headstock spindle

★ new mechanical reverse ★ totally enclosed headstock

★ American type spindle nose

★ spindle stops without stopping motor ★ spindle speeds, 35 to 3500

★ infinitely variable speed drive (Hi-lo ratio 5 to 1)

★ hardened and ground bed ★ reverse ratio 2½ to 1 ★ single lever control

★ single speed motor ★ built-in coolant pump

★ new pedestal cabinet with built-in chip pan and collet rack for 36 collets

Send for descriptive circular on the **WADE NO. 73 HAND SCREW MACHINE**

Address:
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THE WADE TOOL CO.

WALTHAM 54, MASS., U. S. A.

MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

STOP DWINDLING PROFITS!

Botwinik Brothers' Rebuilding Restores The *Profit Factor* To Worn Machine Tools

If your profits are dwindling due to machine tools which no longer operate efficiently . . . STOP . . . THINK . . . ACT! Let Botwinik Brothers of Mass., Inc. restore that all-important profit factor. Botwinik's rebuilding facilities will recondition your present worn out machine tools to new specifications and tolerances . . . *and at a fraction of the cost of new machinery!*

Plant facilities occupying over 60,000 square feet and a staff of seven sales engineers, plus over half a century of experience have combined to make Botwinik Brothers *America's foremost machine tool rebuilders.* Increase your profits by acting now. Let us send an engineer to your plant . . . or we will gladly fly you to Worcester in our own four passenger plane so you can see our facilities and equipment at firsthand.

Botwinik Brothers of Mass. Inc.

6 Sherman St.
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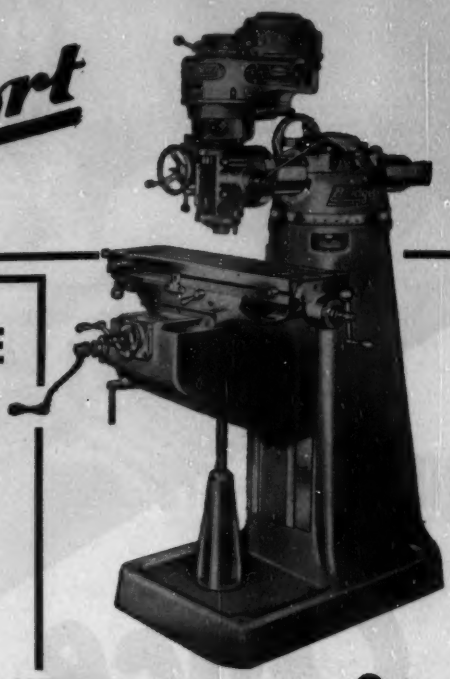
Man With A Bender Is Big Money Saver In Metalworking Shop

One man with a modern automatic bending machine now does the work formerly handled by six men and four presses in producing cam bars for a tractor rear wheel. And, tooling costs have been cut by 75%, scrap losses by 20%.

You will find hundreds of actual case histories . . . thousands of cost-cutting facts like these, in your 1954 PRODUCTION PLANBOOK for Metalworking, which you, as a subscriber to *American Machinist,* received in November. If you aren't already making good use of your new PLANBOOK, familiarize yourself with it now, and always keep it handy. It's worth plenty to you! There is no other single source for so much valuable, exclusive data on efficient modernization and replacement as your 1954 PLANBOOK.

The PRODUCTION PLANBOOK for Metalworking
is published every November by
American Machinist

These 5 Features are exclusive with Bridgeport



...the TURRET MILLING MACHINE that:

1. provides a means of milling, drilling, boring and shaping combined with ability to position the milling head at angles over a wide area . . . *without changing set up.*

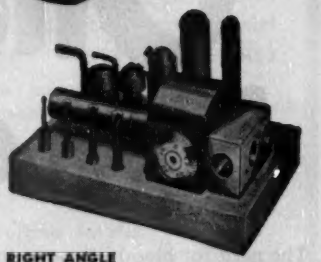
2. will handle a wide variety of work more economically and with greater accuracy . . . in tool room, die shop and in production.

3. has versatility and all-round handling convenience to assure productivity over maximum available machine hours.

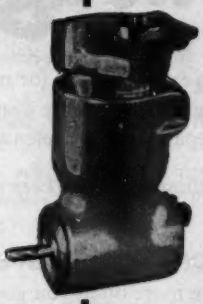
4. can be equipped with attachments specially designed for it and when so equipped offers an outstanding range of utility . . . hence the universal acceptance and phenomenal sales records of this machine.

5. is within the reach of shops large and small because it is moderately priced, making highest returns possible on a reasonable investment in a truly modern machine.

Write us or your nearest dealer for further details, complete description and specifications.



No. 2 BORING HEAD
Boring Tools and Holder provide the means of boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



RIGHT ANGLE ATTACHMENTS
(Left) *Heavy Duty* . . . for milling and drilling at right angles. Fits both Master and 1 HP Bridgeport Heads.

(Right) . . . for right angle milling and drilling narrow, deep molds and cavities.

MILLING MACHINE VISE
An improved vise providing great gripping power. Streamlined for attractiveness; equipped with coolant trough. Large diameter screw assures rigid holding. Two sizes: 5" x 3½" and 6" x 5" jaw openings.

Bridgeport MACHINES, INC.
Bridgeport, Connecticut
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

Once is not enough!

The need for blood is greater than ever, not only for men wounded in combat, but here at home . . . to cure disease, to meet accidents and disasters, and to prepare for civil defense.

Our quota can ONLY be met, if those who give *keep on* giving . . . regularly!

You CAN give more than once . . . as often as every three months with complete personal safety. The more often you give the more often you save a life. For every pint of blood you give goes to someone who needs it desperately.

Remember . . . once is NOT enough. Give blood again and again! Call your Red Cross, Armed Forces or Community Blood Donor Center for an appointment to give blood today.

BUSINESS EXECUTIVES!
CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOOD-MOBILE MAKE REGULAR VISITS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a single pint of blood may mean the difference between life and death for any American . . . the need for blood is urgent!

GIVE BLOOD

...give it again and again

NATIONAL BLOOD PROGRAM

MANUFACTURING EXECUTIVES

$6,000 to $40,000

We have immediate openings with leading national concerns for men with proven records in the following categories:

GENERAL MANAGERS	$15-$35,000
PLANT MANAGERS	$10-$25,000
Asst. PLANT MANAGERS	$ 8-$15,000
PLANT SUPERINTENDENTS	$ 8-$12,000
PLANT FOREMEN	$ 6-$ 8,000
CHIEF IND'L ENG'RS	$ 8-$12,000
CHIEF MF'G ENG'RS.	$12-$15,000
PLANT ENGINEERS	$ 8-$10,000
ENGINEERING DIRECTORS	$15-$20,000
SALES ENGINEERS	$ 7-$15,000

A rapid completely confidential, nationwide service. Send a resume of your experience and interests to Vice President, EXECUTIVE TECHNICAL DIVISION.

Employment Counsel, Inc.

Room 1023, 7 W. Madison, Chicago 2, Ill.

SEARCHLIGHT SECTION

(Classified Advertising)

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UNDISPLAYED ——RATES—— DISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Position Wanted advertising rates are ½ the above rate payable in advance.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

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The advertising rate is $12.60 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

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CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

ASSISTANT TO president of large machinery manufacturer located in East with experience on manufacture of heavy machinery ship administration technical background and ability to embrace larger responsibilities such as works manager. Full details please which will be held in strict confidence. P-2378, American Machinist.

SELLING OPPORTUNITY OFFERED

MACHINE TOOL Salesman to live in and cover Mid-west territory. Represent old, established house selling machine tools and steel to industrial trade. Must have had several years experience in one or both of these lines. Salary and drawing account against commissions—$7,500 minimum yearly guarantee with all expenses paid. Please state age, experience, and references in first letter. Our salesmen know of this ad. SW-2263, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $5,000 to $35,000. We offer the original personal employment service (established 44 years). Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 652 Brisbane Bldg., Buffalo 3, N. Y.

POSITION WANTED

BLIND VETERAN — trained in machine shop practice, can operate engine lathe, miller, shaper and surface grinder, as well as drill press using jigs and is good assembler. Seeks production job on engine lathe. New York City or vicinity preferred. PW-1513, American Machinist.

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WANTED to buy for cash Back Volumes and Sets of this Journal and other technical Periodicals, Ashley, 24 E. 21 St., NYC (10).

WANTED

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

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Propane Gas Installations
and
Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
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— illustrated —
Write today for folder describing book
MACHINE TOOL PUBLICATIONS
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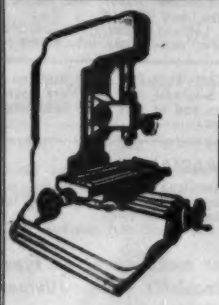

SEARCHLIGHT Equipment Spotting SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used and surplus new metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

First, read the dealer ads on the following pages. A 5-minute study may locate the equipment now.

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Searchlight Equipment Spotting Service
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330 W. 42nd St., N.Y. 36, N.Y.

Your requirements will be brought promptly to the attention of the used equipment dealers advertising in this issue. You will receive replies directly from them.

NO CHARGE • NO OBLIGATION

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5/10/54

Guaranteed Machine Tools

HEADLINERS

Reasonable Prices

MILLING MACHINES

No. 5 Cincinnati High Power Plain, rect. overarm, a.c. m.d., feed control in knee, power quick traverse
No. 4 Cincinnati High Power Plain, rect. overarm, a.c. m.i.b., feed control in knee, power quick traverse
No. 4 Milwaukee D.O.A. Plain, a.c. m.i.b., p.r.t., Timken, #50 taper
No. 4 Cincinnati High Power Universal, a.c. m.d., div. hds.
No. 4-B Brown & Sharpe Heavy Plain, a.c. m.d., all geared
No. 3-K Kearney & Trecker Vert., a.c. m.i.b., p.f. to slid. hd., p.r.t.
No. 3-B Brown & Sharpe Heavy Plain, a.c. m.d., all geared
No. 3 Cincinnati Dial Type Medium Speed Plain, a.c. m.i.b., p.r.t., Timken, #50 taper
No. 2 Cincinnati Dial Type Medium Speed Universal, a.c. m.i.b., p.r.t., Timken, #50 taper
No. 2-MH Cincinnati Rect. overarm Plain, a.c. m.i.b., Timken, #50 taper, speed range to 1200 r.p.m., new 1940

LATHES

60"x21' ctrs Niles-Bement-Pond Heavy Duty Grd. Hd., actual swing 68", screw cutting, 4-speed a.c. m.d., taper attachment
50"x15' ctrs. Pittsburgh Hvy Duty Triple Geared quick change, taper, very clean
48"x33' ctrs Niles-Bement-Pond Heavy Duty Grd. Hd., screw cutting, 30 h.p. d.c. drive, taper attachment
36"x120" ctrs American 12-speed Grd. Hd., a.c. m.d., taper attachment
36"x96" ctrs Schumacher & Boye Triple Geared, cone drive, taper attachment
22"x74" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., a.c. m.d., taper attachment
20"x72" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., a.c. m.d.
19"x54" ctrs LeBlond "Regal" Grd. Hd., a.c. m.d., Timken, new 1940
19"x48" ctrs LeBlond Heavy Duty Grd. Hd., 12-speed, a.c. m.d., taper attachment

2—Type "A" BULLARD 16" Mult-au-Matics, 6-spindle, a.c. m.d. Very clean machines and in very good operating condition

RADIAL DRILLS

3'-9" col. American High Speed, arr. m.d. thru gearbox, top speed 1500 rpm, fully enclosed head, very clean
3½'-9" col. Morris, a.c. m.d. gearbox
4'-11" col. American, a.c. Lima Drive
5'-13" col. American, a.c. m.d.
5'-13" col. American Triple Purpose, a.c. m.d. on arm
7'-17" col. Dreses, a.c. Turner Uni-Drive

MISCELLANEOUS

3¼" bar No. 25-C Defiance Horz. Boring Mill, a.c. m.d., table 40"x75", Timken, measuring equipment, 1942, excellent

A-1-8 Arter Rotary Surface Grinder, a.c. m.d., 8½" chuck, new 1943
24" Bullard "New Era" Vertical Turret Lathe, a.c. m.d., side head, p.r.t., threading attachment
Model G Cleveland Punch & Shear, a.c. m.d., 60" throat capt. 2" thru 1"
No. 4 Fosdick 4-spindle High Speed B.B. Sens. Drill, a.c. m.d., 12" o.h., new 1941
No. 25-S V&O Dial Feed OBI Punch Press, a.c. m.d., 25 tons, 5½" stroke
50-ton WARCO O.B.I. Press, a.c. m.d., pneumatic clutch, new 1946, 4" stroke
1¼" Cone 4-spindle Automatic, a.c. m.d., bar feed
No. 1 Fisher Oil Groover, a.c. m.d., relieving and taper

We have many other machines of all types in stock. Send us your inquiries. Phone: JUniper 3091

COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO
Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

The world's best . . . one-piece, drop-forged—not welded—of mild carbon steel, heat-treated, with head accurately milled for standard tables on lathes, planers, boring mills, milling machines. Integral washer and nut. Sizes: up to 30". Write for prices.

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MILFORD 2, NEW HAMPSHIRE

MODERN MANUFACTURING FACILITIES AVAILABLE IN OUR MACHINED AIRCRAFT PARTS DEPT.

Monarch Air Tracer Lathe—20" & 14"
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Monarch Keller Lathe—16"
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Internal & External Grinders
Also modern drilling and milling equipment

J. G. TILP, INC.
BOX 554, UNION, NEW JERSEY

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Priced To Sell!

LANDIS 10"x96" Type C Plain Hydraulic Cylindrical Grinder M.D. Coolant.

MOORE #1 Precision Jig Borer standard equipment, many extras. New 1943.

BULLARD 44" Maximill, 2 Rail Heads, 4 Jaw Chuck.

BULLARD 42" Spiral Drive Vertical Turret Lathe Univ. Forming Att. M.D.

HEALD 72A8 Hydraulic Internal Grinder. 69" Extended Bridge, Redhead Spindle, Coolant. LATE TYPE.

POTTER & JOHNSON No. 8 DREL Automatic Chucking Machine. 34" Swing, Tooling. LATE TYPE. Never used.

HENRY & WRIGHT, 25 Ton Dieing Press. 1½" stroke, double roll feed, scrap cutter, Reeves Drive. LATE TYPE.

Complete Stock List Upon Request

UNITED MACHINERY and Tool Corp.
85 Thomas St., Worcester 8, Mass.
Telephone 6-7171

SPECIALTY MACHINE WORK

High Precision Dividing Both Linear and Circular on Dials, Scales, Verniers, etc.

Tracer Controlled Lathe Work. Stepped Shafts, Turned Contours, etc.

We invite your inquiries

F. T. GRISWOLD MFG. CO.
Lancaster Ave., Devon, Penna.
Phone Wayne 4080-4081

AVAILABLE MACHINE TIME

Manufacturer in New York Metropolitan Area with 50 years experience in precision work has some available machine time for following:

Internal Grinding
Cylindrical Grinding
Gear Grinding
Parts Made Complete

Send prints for Quotation.

CW-2623, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them.

GENERAL PATTERN WORKS
223 Butler Street Cincinnati, Ohio

CONTRACT WORK WANTED
SCREW MACHINES to 2¼ DIA.

Thread Milling and Crush Form Grinding, Milling, Drilling and Surface Grinding.

STANDARD BUTTON MACHINE CO., INC.
245 Franklin St., Paterson, N. J.

New "SEARCHLIGHT" Advertisements

received by May 10th, will appear in the May 24th issue, subject to space limitations.

Classified Advertising Division
AMERICAN MACHINIST
330 West 42nd St., New York 36, N. Y.

BUY FROM STOCK
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FALK
MACHINERY COMPANY

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N. Y.

Every Item Guaranteed as Represented

No. 7 BARDONS & OLIVER Universal Turret Lathe. 2½" capacity. Preselector Head, Late Type.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, Motor Driven, Late type.

No. 1 LaPOINTE Motor Driven Horizontal Broach, 5 tons cap., 38" stroke.

50 HP. CHICAGO PNEUMATIC Air Compressor. Type NSB, 253 CFM, Piston Displacement.

4'x15" Column CINCINNATI-BICKFORD "Super-Service" Radial Drill, Motor on arm, Box table.

No. 262 BARNES Motor Driven Sliding Head Drill Press. 2" cap. in steel.

No. 2 M.T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

6"x18" LANDIS Type "C" M.D. Hydraulic Cylindrical Grinder, Serial ‡29196.

6"x18" NORTON Vertical and Horizontal Hydraulic Surface Grinder, complete with magnetic chucks, coolant systems, Late Model.

‡TG615 JONES & LAMSON Thread Grinder, Late, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

No. 8LS FELLOWS M.D. Gear Lapping Machine. With Detachable Head, Universal Work Support.

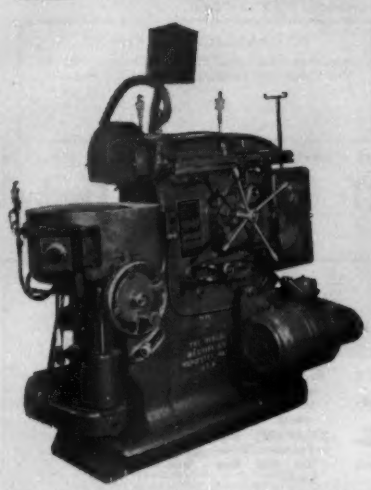
No. 13LSI FELLOWS M.D. Gear Lapping Machine, with Detachable Head and Universal Work Support.

20", 24" 28" Gould & Eberhardt V-Ram Shapers, M.D.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

30 K.W. LEPEL High Frequency Induction Heater.

16"x54" centers AMERICAN Pacemaker Lathe, Taper Attachment, Late Model.



No. 22 HEALD MOTOR DRIVEN ROTARY SURFACE GRINDER. 12" Magnetic Chuck. Late Model.

20"/27¾"x14' AXELSON Lathe, 115" centers, Taper Attachment, Late.

24"x12' BOYE & EMMES Timken Bearing, Geared Head, Lathe. Late Type.

27"x16' NILES, BEMENT, & POND Geared Head Lathe, 9' centers, M.D.

24", 36" BULLARD Vertical Turret Lathe, New Era, Turret Head, Side Head, Motor Driven.

No. 601 W.D. OSTER Motor Driven Turret Lathe, 1½" capacity, Late.

No. 2, No. 5 WARNER & SWASEY Geared Head Turret Lathes, Bar Feed, Motor Driven.

‡2 KEMPSMITH Horiz. Maxi-Mill, Motor in base, Vert. Head.

‡08 CINCINNATI Vert. Mill, Plain & Rotary Table Type.

‡3B Kearney & Trecker Vertical Milling Machine, Motor in base.

No. 0-8 CINCINNATI Rise & Fall Horiz. Mill, Late Model.

No. 3B KEARNEY & TRECKER Horiz. Mill, Double Overarm, Motor in base.

No. 2M CINCINNATI Universal Horizontal Mill, Full Equipment, M.D.

‡M200 DEFIANCE Production Drilling Machine. 2" Cap. in Steel.
‡5 M.T., Coolant System. Late Type. 26" Swing, 1942.

No. 5 FEDERAL Open Back Inclinable 4" stroke, Timken Bearing Flywheel, M.D.

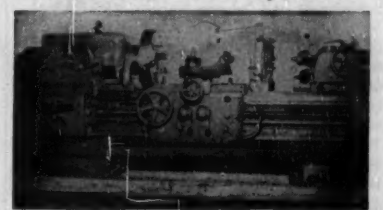
600 ton NILES-BEMENT-POND Motor Driven Wheel Press, 86" between strain rods, 14' capacity, 17" diameter ram.

‡5, ‡7, ‡8 JOHNSON O.B.I. Presses. 56, 79, 90 tons cap. M.D. Flywheel & Geared Type.

10"x10" RACINE ‡30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10'x10 ga., 10'x¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

No. 20, No. 30 WATERBURY FARREL Thread Rollers, ⅜", ½" cap., 1944.



24"x10' AXELSON GEARED HEAD, HEAVY DUTY MODEL "E" 28" ACTUAL SWING, M.D. TAPER ATTACHMENT.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK • SEND US YOUR INQUIRIES

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AUTOMATICS
Brown & Sharpe (1) Model #4
Brown & Sharpe (2) Model 2G, 1¼" & 1½"
Brown & Sharpe (8) Model 0G, ⅜" capacity.
Brown & Sharpe (4) Model 00G, ⅜" capacity.
Ceco Screw Machine ⅜" capacity.
Cleveland Model AA-11. Model B.
Cleveland 1½", Conomatic 4 Sp.

BORING MILLS
Bullard 24" V.T.L. Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity, Defiance 3¾" Bar
Giddings & Lewis #32, 3", #25, 2½" Bar
Kings 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4" 4½" Bar, 60" Vert.
Ohio 5" Bar. Universal 3"
Morris 6'—Radial

DRILLS AND RADIALS
American 6'x15" Universal, 4'13", 3'9"
Baker No. 321 Vertical Boring & Drill
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42 RPMSTERS
Cincinnati Bickford 6'15" col. 3'9"
Natco #12, 20 spindle. Model B2A—10 Sp.
Leland-Gifford 2 LMS, 3MS
Leland Gifford No. 2—4 Sp.

ENGRAVERS
Gorton #ME, 1D, 3Z, Deckel G1L, G1, G2
Gorton Graduating Mod. #687-1
Preiss UAM. New 3 Dimensional
Taylor-Hobson 3 dimensional Pantograph

GRINDERS, MISCELLANEOUS
Brown & Sharpe #2 Universal 14"x28", #3 Univ.
Brown & Sharpe #5, 3"x18" Cylindrical
Brown & Sharpe #13 Universal Tool & Cutter
Cincinnati 6x18" Hyd. #4—Centerless—#2
Douglas Tool & Cutter 8"x15"
Gardner Disc Grinder 30"—15 H.P. Motor
Heald 72A3 Int. Centerless Sizematic
J. & L. Thread; TG615, Lempco 54" Swing
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.

GRINDERS, SURFACE
New 9x24" Hyd. Feed 10x8", 6x18
Abrasive 8x24", #33 Vert. & #34
Brown & Sharpe #5, #2 with Chuck
Gallmeyer & Livingston—65
Heald 22—12" chuck, Arter 12", Covel No. 15
Norton 6x18 Hyd. #15 Covel Hand.
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vertical
Thompson 6x18

GEAR EQUIPMENT
Barber Colman #18 Hob Grinder
Barber-Colman Mod. SHS, Sharpener
Barber-Colman #3, #2, #12 (3) also Type 5
Fellows High Speed Shapers 712, 725, 71, 7, 61A
Gleason Gear Rougher, Gleason #6 Power Tester
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Mikron No. 79 Gear Hobbers
Michigan Univ. Hob & Cutter Relieving
Sykes 2A Generator

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Cincinnati 22"x10'
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42 and 12x30", 16x160"
LeBlond Regal 10"x3' bed, 13x42", 17" Late type
LeBlond 25/50x96" Gap, Late type.
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
Rivett Model 918 Precision. Mod. 715
Putnam, Sliding Gap 22"/46"x92"
Sebastian 14"x6", So. Bend 13"x42", 14"x28"
South Bend 13"x5' Q.C.G., 10"x3½ Taper Att.
Sundstrand 8x15", 15' Stub

HYDRAULIC EQUIPMENT
Injection Molders, Pumps, Presses 125 to 800 Tons. Accumulators, Hobbing Presses, Etc.

Completely Engineered by a Competent Staff

MILLS, VERTICAL
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, 08 Vertical
Gorton 8D Super Speed
Milwaukee 4K & 2K
Morey #12M Profiler, 2 sp. #2 Maximiller
Reed Prentice Vert. Mill & Die Sinker Mod. 3VG

MILLS, PLAIN, UNIV. PROD.
Brown & Sharpe #0 Omniversal, #000 Production
Brown & Sharpe #2B Plain, No. 2, 3A, 21, #2L
Cinn. 08 Rise & Fall, 2-24 Automatic
Cinn. #3, 4 Plain, #18 Mfg. #5-48 Hydro.
Kent Owens IV, 1-8, 1-14, 1M, 2-20
Milwaukee 2H Universal, 2H Plain
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ., Dividing Heads, Mod. 1-18
(8) Van Norman #12—Hor/vert—Late

PRESSES
Bliss 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss 5-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Stokes Tablet Presses, Mod. R, RD3, RD3S, DDS.
Thomas 56 Ton O.B.I.
Walsh No. 3 O.B.I. 23 Ton, LI #3
Z & H #4½, O.B.I. 20 Ton, 36-6 Back Gear

TURRET LATHES
Bardons & Oliver #2, 3, 7 Bar Feed
Gisholt 2L, Cross Slid. Tur. & Hardinge DSM-59
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—9¼" hole in spindles
Jones & Lamson, Mod. 8A, No. 5
Warner & Swasey #1, 1A, 2, 2A, 3, 3A, 4, 5

MISCELLANEOUS
Band Saw: New Kalamazoo & Johnson. Grob.
Bending Roll: Reed-Power 5", 48"—8 ga.
Bolt & Pipe Threader: Landis, Oster-Williams
Broach: New 6 Ton Horizontal, 11 Ton Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6", Marvel #9
Shear: Power Squaring Cinc. 6'x⅜"—18" gap

This is but a partial listing. Hundreds of others in stock.

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Serving the World's Largest Manufacturers

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3'9" MORRIS MOR-SPEED RADIAL DRILL
#3 B&S Cylindrical Grinders. Late
20"x10' Bed L&S Model E Selective Head Engine Lathe —Serial #29266
#5 Late Type Gisholt Turret Lathe—Serial #848-56
No. 47 Heald Single End Borematic — Serial #4646
22"-44"x80" Bed Putnam Sliding Bed Gap Lathe

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LATE TYPE MACHINE TOOLS

48" Jungenthal Vertical Turret Lathe. New.
650 Ton Verson Double Action Eccentric Press. 1940.
No. 41 Lucas Horizontal Boring Mill. 1941.
DB-215A Excello Double End Boremetic. 1945.
HP-100 LaPointe Horizontal Hydraulic Broach. 1945.
12" Gleason Gear Generator. 1942.
No. 7 Gleason "Revex" Gear Rougher. 1943.
16"x72" Norton Univ. Grinder. 1942
TG 6"x36" Jones & Lamson Thread Grinder. 1943.
No. 35 Excello Precision Thread Grinder.
24-36 Bryant Hydraulic Internal Grinder. 1942.
No. 72A3 Heald Plain Hydraulic Internal Grinder. 1941.
No. 24D Mattison (Hanchett Type) Duplex Grinder. 1945
No. 10 Sundstrand Automatic Lathe F & R Slides. 1942.
No. 6DRE Potter & Johnston Automatic. Late.
No. H5 Libby Universal Saddle Type Turret Lathe. 1939.
No. 3R Gisholt Universal Saddle Type Turret Lathe. 1942.
No. M-18 Kearney & Trecker Simplex Mill. 1943.

Write for Complete Stock List

Indianapolis MACHINERY & SUPPLY CO.

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MACHINERY FOR SALE

Brown and Sharpe Hobber, No. 44, serial No. 104 with Crocker Wheeler Motor, serial No. 748275. Equipped to cut spur and spiral gears and splines.

Schuchardt and Schutte Hobber, 36" CAP TP #2, serial No. 6706. Equipped with differential for cutting spur, spiral, and worm gears.

60" Reinecker Hobber, RF No. 4N, Serial No. 6937/1. Completely rebuilt. Equipped with Tangential feed and differential.

These hobbers now being used in production and in excellent condition. Can be seen in operation.

1—Monarch Lathe 12" and serial No. CK 3919.

1—Monarch Lathe 14", serial No. C-5239.

All of the above equipment motorized, 220 volts AC, 3 phase.

PS-8480, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

WANT TO TRADE

The following 3 machines for 12x72" or 14x72" standard make EXTERNAL GRINDER. Also need a Natco Multiple Drill Press. Must be recent models and in excellent condition. Advise what credit you would give us on trade-in basis.

36" Schuchardt Hobber, Serial #6706—in excellent working condition. Maintains gear hobbing within .0006 tolerance and up to 36" diameter.

Brown & Sharpe #44 Hobber, Serial #104—in good working condition. Can hob up to 12" in diameter. Equipped for spur, helical & spline work.

Landis EXTERNAL GRINDER—10x48" Type DC. Serial #30186—in excellent condition.

Advise make, serial number, condition and full particulars.

T-2315, AMERICAN MACHINIST
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Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

PLANERS

P10 Coulter Crank Type Shaper-Planer, 1 head, m.d.
20"x20"x5' Whitcomb-Blaisdell Planer, 1 head, m.d.
24"x24"x5' G. A. Gray Planer, belted m.d., 1 head on cross rail
24"x24"x8' G. A. Gray Planer, belted m.d., 1 head on cross rail
30"x30"x8' Cincinnati Double Housing, 2 rail heads
30"x30"x10' Cincinnati, belted m.d., 2 heads
30"x30"x10' G. A. Gray, belted m.d., 2 heads
36"x36"x8' Cincinnati, m.d., 2 heads on rail
36"x36"x10' Betts, belted m.d., 2 heads on rail, 2 side heads
36"x36"x10' Gray, Extra Heavy Pattern, m.d., 2 heads on rail
36"x36"x10' Niles-Bement-Pond, belted m.d., 1 head on cross rail
36"x36"x12' Betts, m.d., 2 heads
36"x36"x18' Niles-Bement-Pond, 2 heads, variable speed m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
36' widened to 42"x36"x20' Cincinnati, m.d., 2 rail heads, 1 side head
42"x42"x14' Niles-Bement-Pond, reversing m.d., 2 rail heads, 1 side head
42"x42"x26' G. A. Gray, 2 heads, belted m.d.
48"x48"x18' Niles-Bement-Pond, 2 heads, belt
48"x48"x28' Cincinnati, reversing m.d., 4 heads
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
56"x42"x14' Cincinnati, belted m.d., 2 heads
72"x72"x36' Niles, 4 heads, reversing m.d.

SAWS

No. 4XB Robertson Economy Saw, m.d., new
No. 4B Robertson Economy Saw, m.d., new
Gustav Wagner Cold Saw, m.d.
Kolle Heavy Duty Steel & Metal Bandsaw, Model HSM-40, new
6x6" Racine Power Hack Saw, model 20
6x6" Peerless Hack Saw

RAILROAD MACHINERY

No. 2 Niles-Bement-Pond Double Head Axle Lathe, m.d.
No. 3 Niles-Bement-Pond Double Head Axle Lathe, m.d.
48" Niles-Bement-Pond Car Wheel Borer, m.d.
90" Niles Balanced Quartering & Crank Pin Turning Machine, latest
90" Putnam Driving Wheel Lathe, m.d.
90" Niles Journal Lathe, including 2 inside journal turrets and 3½" spindle double quartering attachment, m.d.
90" Niles Driving Wheel Lathe, m.d., latest
Niles-Bement-Pond Quartering Machine, m.d., new

SHAPERS

16" Hercules Shaper, m.d., new
24" Potter & Johnston, cone
20" American, m.d.
24" Gould & Eberhardt Crank Shaper, m.d.
32" Cincinnati H.D. Back Geared, cone, motorized
32" Morton Draw-Cut, m.d., late
36" Morton Draw-Cut, m.d., late

SLOTTERS

10" Newton, m.d.
10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
18" Dill, m.d.
18" Betts Crank Slotter, m.d.
18" Niles-Bement, s.p.d.
20-24" Dill, m.d.
22" Betts, m.d.
48" Niles, m.d.

TAPPERS

No. 1 Haskins, pneumatic control, type 1 CAP
No. 2 Haskins, pneumatic control, type 2 CAP
No. 3 Haskins, pneumatic control, type 3 CAP
Acme Semi-Automatic 6 spindle, 1½", arranged 1-v m.d.
No. 3C Haskins, pneumatic control, type 3 CAM, m.d.
2 spindle Haskins, pneumatic control
No. 22 Murchey, 6 to 28 pitch

SHEET METAL MACHINERY

Doty Mfg. Co. 6' Pyramid Type Bending Rolls
No. 3 Hyerson Rotary Bevel Shear, 4" throat
Gray Turret Head Metal Cutter, cap. ¼", 36" throat
No. 2 Libert Nibbler, 28" throat
No. 3—⅜" cap. Gray Sheet Metal Cutter, m.d.
No. 336 cap. ⅜" W. J. Savage Co. Nibbler

TURRET LATHES & SCREW MACHINERY

No. 601 W. D. Oster Geared Head Rapiduction, m.d. in leg, chucking
No. 1 Warner & Swasey "Electric", m.d., bar
No. 1A Warner & Swasey, m.d.
No. 1, 2 Cincinnati-Acme Full Universal, m.d.
No. 2A Warner & Swasey, m.d., bar
No. 2F Foster Fastermatic, m.d., Timken
No. 2G Mersy, 1" cap., bar
No. 3 Cincinnati-Acme Full Universal, m.d., chucking
No. 3 Warner & Swasey, m.d.
No. 3 Foster Geared Head, m.d.
No. 3A Warner & Swasey, m.d.
No. 3F Foster Fastermatic, m.d., Timken
No. 4 Warner & Swasey, cone, bar and chucking types
No. 4 Warner & Swasey, preselector head, m.d.
No. 4A Warner & Swasey Universal, m.d., chucking
No. 4L Gisholt Universal, m.d.
No. 4FU Foster Fastermatic, m.d., latest
No. 5 Foster Universal Ram Type, m.d.
No. 5 Gisholt Full Universal, m.d., late type
No. 5 Warner & Swasey, m.d.
No. 7 Bardons & Oliver, m.d.
No. 7 Bardons & Oliver, cone
⅝" Pratt & Whitney Hand Screw Machine, cone, bar
2½x24", 3½x32", 4x34" Jones & Lamson Geared Head, m.d., bar & caucking
18" Libby Type A, m.d., chucking

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK AUTOMATICS, BOLT THREADERS, HORIZONTAL & VERTICAL BORING MILLS, GEAR MACHINERY, GRINDERS, ENGINE LATHES, MFG. LATHES, MILLING MACHINES, PIPE MACHINES, PUNCHES & SHEARS, ETC.

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8" 6 Spdl Bullard Mult-Au-Matic
14¾"x10" Fay (Flanders)
20"x25" Fay, timken, new 1942 (2)
26"x37" Fay, serials 80551 & 80552.

COMPRESSORS

275 CFM 10"x10" Union horizontal enclosed
311 CFM 12"x8" Ingersoll Rand air or gas
327 CFM 12"x7½"x12" Ingersoll Rand Imperial type
1400 CFM 21"x13"x16" Worthington Laidlaw horizontal

DRILLS—RADIAL

3½' arm 8" column American sensitive radial
4' arm 13" column Carlton MIS radial, late
6' arm, 3' extension, 16" column American radials, late type (two)

GEAR HOBBERS

No. 3 & No. 12 Barber Colman
Type A Barber Colman universal
No. 12H Heavy Gould & Eberhardt universal
No. 36H Gould & Eberhardt
16" Cincinnati spur and spiral
8'-10" No. 1 Lees Bradner
No. 7S Lees Bradner
No. 3 Adams Farwell
72" B. & S. universal

GEAR MACHINERY MISC.

8" Red Ring Gear Shaver, two, late
8" Red Ring gear lapper
No. 00 Cross gear tooth rounder
Barnes "Mal" Hut O Lap gear lapper
National Cleveland gear checker
100"x24" Newark No. 7 spur gear cutter
10" Pratt & Whitney hydraulic gear grinder
Nos. 71A, 75A, 712 and 715 Fellows high speed gear shapers
Illinois gear measuring machine
No. 343 SheBield gear chamferer

GRINDERS

72" Hanchett rotary surface, new 1945
10"x36" Landis type DC, cyl. late, hydraulic
14"x36" Landis type C, cyl. hydraulic, late
18"x36" Norton type C, cyl. hydraulic, late
No. 2 Cincinnati centerless, plain and Filmatic bearing
10"x18" Cincinnati Filmatic bearing
10"x18", 10"x36" & 16"x72" Norton cylindrical
12"x36" Cincinnati universal cylindrical, serial 1U-3D-1D-5
16"x90" Landis cylindrical
16"x96" Landis cap type cylindrical
No. 120A Gardner opposed spindle disc, 20"
23" No. 84 Gardner opposed spindle disc
53" No. 24A Gardner horizontal disc
30" No. 8 Badger double disc motor on spindle
No. 72A3 Heald plain hydraulic internal
No. 72A3 Heald Gagomatic internal
No. 72A3 Heald Sizomatic internal
No. 5 Bryant internal
5"x18" Norton vert. spindle hydraulic surface
8"x22" No. 3 Abrasive surface
12"x48" Model 300 Hanchett surface
No. 3 Barber Colman hob sharpener
10" Pratt & Whitney hydraulic gear

LATHES

24"x14' bed American GH, QCG, serial 44870
12" Sundstrand Stub lathes (three)
No. 3A Warner & Swasey long bed universal T/L, late
H5 Libby International saddle type universal T/L, Late
Leonard hydraulic tube spinning lathe, new 1947
14"x42" Hendey CamLoc, timken, toolroom
14"x10" Lipe HS Carbe-lathe, new 1943
12"x6' LoBlond Mfg. timken, (three)
48"x52"x20'6" Niles Bement Pond engine lathe, like new

MILLING MACHINES

1-18 Cincinnati production miller
No. 2L Van Norman universal, vertical head, late
No. 3 Sundstrand Rigidmill production
12" Cincinnati plain manufacturing, also 18"
24"x24"x12' Ingersoll adjustable rail planer type mill. mach., tracer controlled, new 1945
4—36 Cincinnati Hydromatic production
4—48 Cincinnati Hydromatic production
No. 2 Cincinnati high speed dial type plain
No. 1 Milwaukee vertical mill
No. 2B and 3K Milwaukee universal
No. 3B and 4K Kearney & Trecker plain

PRESSES

15 & 25 & 50 Ton Dennison hydraulic (4)
56 ton No. 304 Bliss, SS, solid frame, new 1942
60 ton No. 81 Cleveland, OBI (two)
88 ton No. 50-D-36 Cleveland, DC, steel frame
95 ton No. 7 Hamilton, OBI, steel frame (three) new 1947
126 ton No. 308 Bliss, SS, tiered frame
180 No. 94½ E Toledo, DC, tiered frame
300 ton No. 1042 Verson, SS, all steel, air clutch, late model
650 ton No. DA 8411 Hamilton SS, toggle drawing

SHAPERS

16" American
16" American Heavy pattern Auto-sliod
24" Cincinnati Climax heavy duty
26" Morton draw cut shaper
32" G & E shaper

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1000 LATE TYPE TOOLS IN STOCK

BROACHES

COLONIAL VGI-10-48 Vertical, cap. 20,000 lbs.; 48" stroke, Hydraulic; late
LaPOINTE 10-54" Vertical, Model SRV, cap. 20,000 lbs.; 54" stroke; new 1947
OILGEAR 3XA Horizontal, cap. 20,000 lbs.; 96" stroke, Hydraulic; late

DRILLS

AMERICAN 4' arm 11" col. "Helo Wizard"; late
AMERICAN 5' arm 13" col. "Helo Wizard"; late
NATCO Model B4B Multiple Spindle; late type
NATCO Model E5 Multiple-Spindle; late type

GEAR EQUIPMENT

FELLOWS #6, 61-A, 75 H.S. Gear Shaper, late
GLEASON 12" Spiral Bev. Cutter Sharpener; late
GLEASON 3" Spiral Gear Generator; late type
GLEASON #17 Spiral Bevel Hypoid Gear Grinder;
GLEASON #24 Straight Bevel Gear Generator;
GLEASON 24", 37" Bevel Gear Planer; late type
BARBER COLMAN Type "A" Gear Hobber; late
GOULD & EBERHARDT #12-H Gear Hobber;
GOULD & EBERHARDT #120-H Double Head Universal; late

GRINDERS—Cylindrical, Plain and Universal

CINCINNATI 10"x48" Plain "Filmatic"; late type
LANDIS 10"x18" type "C"; Plain; hydraulic; late
LANDIS 14"x72" Plain type "C"; plunge type;
NORTON 4"x12" model CTU Plain, year 1953
NORTON 10"x48" type "C" Hydraulic; Plain Cyl.
VAN NORMAN No. 666, 48" centers, crankshaft

GRINDERS—Internal

BRYANT No. 3 Internal; hydraulic; late
BRYANT No. 5 Internal; hydraulic; late
BRYANT No. 16-C-16 Internal; hydraulic; late
BRYANT No. 24-36" Internal; hydraulic; late
HEALD No. 70A Internal, M.D., late
HEALD No. 81 pl. chuck type, New 1947
HEALD No. 72A5 Plain Internal; late type
HEALD No. 72A5 "Gagomatic" Internal; late

GRINDERS—Surface

ABRASIVE No. 34, 8"x24" table; late type
BILLITER No. KLUNZ 48"x190" Way, Grinder;
BLANCHARD No. 11, Vert. Rotary; 10" chuck;
HEALD No. 22 Rotary, 12" chuck; M.D.; late

LATHES—Turret

BARDONS & OLIVER #5 Universal ram type;
GISHOLT #3, #1L, #2L saddle type; Timken;
MOREY #2, #3, #4 ram type, Timken; late

MILLING MACHINES—Plain

CINCINNATI No. 4 Dial Type; Timken; late
CINCINNATI No. 4 High Power; Timken; late
KEARNEY & TRECKER Model 2HL; M.D.; late
KEARNEY & TRECKER 4H Plain, Timken; late

MILLING MACHINES—Thread

HALL Style "D" Planetary; late
LEES BRADNER #LT 6"x36"; #HT 12"x24"; #HT 12"x36" centers; late type
MOREY 12"x30" centers; late type
MOREY 12"x100" centers; late type

MILLING MACHINES—Universal

CINCINNATI #3, dial type, Timken; M.D., late
KEARNEY & TRECKER 3K; Timken; late type
RICHMOND No. 1½, Table 9"x36"; light type;
VAN NORMAN No. 36 ram type; Timken; late

MILLING MACHINES—Vertical

CINCINNATI 0-8 Vertical, Timken; late type
CINCINNATI No. 3, Dial Type, High Speed, latest type; new 1953
KEARNEY & TRECKER 3H High Speed, Timken

PLANERS

GRAY 36"x36"x10' dbl. housing "Maximum Service"; M.D.
GRAY 24"x24"x8'; motor drive; late
LIBERTY 144"x70"x48" adj. variable openside; box table; 4 hds; PRT
NILES 48"x48"x12' double housing; late
NILES 72"x72"x30'; 4 hds; PRT; M.D.

SAWS

CAMPBELL #401 Abrasive; cut off; late type
NEWMAN #675, 6"x6" cap. High Speed Hack; NEW
PEERLESS 6"x6" Hack Saw; auto. feed; late
PORTER-McLEOD #2A West abrasive cut-off saw

SCREW MACHINES—Automatic

ACME GRIDLEY RA6, 9/16" 6-spindle; late type
ACME GRIDLEY R0, 1⅝" 6-spindle; late type
CONOMATIC 4⅝ 4-spindle; motor drive; late
NEW BRITAIN GRIDLEY Model 605; 6-spindle chucker; latest type; new 1943

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GRINDER, 16"x96" Landis Hyd., Late
24"x168" Con. Norton "C", 1943.
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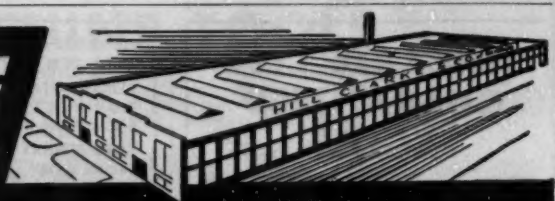

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Partial List

Automatics
1-1/16" Cleveland Model A (1942).

Boring Machines
No. DB2112 Excello Single End Borer
100" Niles-B-Pond Vert. Bor. Mill.

Drills
No. 2 Avey Cam Fd. Drill. 14" Swing.
2 Spdl.—24" SW.—No. 3 Avey.
No. 57H Fox 24 Spindle Multiple Drill (1943).

Gear Machines
11" Gleason Gear Generator.
No. 12HS Gould & Eberhardt.
No. 36-BM G. & E.—3 spdl. Rougher.
615-A Fellows Gear Shaper.
612-A Fellows Gear Shaper.
No. 64 Fellows Gear Shaper.

Grinders
6"x18" Norton Type C Plain (1943).
10"x18" Norton Type C Plain Hyd. Cam Gdr.
10"x36" Norton Type C Grinder.
10"x36" Norton Type C Cam Grinder.
14"x48" Landis Type C Plain Gdr.
16"-24"x168" Norton Type C (1942).
B-24—25" Chuck Arter Surf. Gdr.
TG615 J & L Thread Gdr.

Internal Grinders
No. 1109 Bryant Internal Gdr. (1951).
No. 5 Bryant Internal Grinder.
No. 5B Bryant Internal Grdr.
No. 16-16 Bryant Int. Grinder.
No. 16-28 Bryant Int. Grinder.
No. 24 L-36 Bryant Hyd. Int. Gdr.
No. 16 A-28 Bryant Internal Grinder.
No. 24-26 Bryant Int. Grinder.
No. 24-36 Bryant Internal Grinder.
No. 81 Heald Internal Centerless.
72-A5 Heald Int. Gdr. (1942).

Hill-Clarke Norton Type Motor Driven Grinders
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26"x96" Norton.

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Model H-2 Micromatic Horiz. Hone.
Model 200-HS-Dbl. End Micro. Horiz.
Model H-7 Micromatic Vert. Hone.

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R-14 Lo-Swing Automatic Lathe.
18"x6' Am. Geared Head Lathe.
18"x8' Lodge & Shipley Grd. Hd.
27"x12' American Geared Hd. Lathe.
27"x12' centers LeBlond Lathe.
36"x18' Putnam Grd. Hd. M.D.

Turret Lathes
No. 5W Acme Tur. Lathe (Late).
No. 3AL Gisholt, Cross-Slide Turret.
No. 3 Warner & Swasey Turret Bar Feed.
No. 4A Warner & Swasey Turret.
No. 6 Warner & Swasey, cone head.
2¼"x24" Jones & Lamson.
18" Libby, M.D.
No. 4A Warner & Swasey (1944).
No. 4A Warner & Swasey, Taper, Cross-sliding Turret (1942).

Planers
48"x36"x14' Gray, 2 Heads.
48"x48"x12' Cincinnati, 2 Heads.
60"x48"x27' American, 4 Heads.

Milling Machines
No. 08 Cincinnati Vert. (1942).
No. 12 Cincinnati Pl. Auto.
4" Taylor & Fenn Duplex Spline.
6"x168" Pratt & Whitney Thrd. Mill.
10"x48" Hanson-Whitney Thrd. Mill.
10"x60" Pratt & Whitney Thrd. Mill.
12"x102" Mod. HT Lees Bradner Thrd. Mill.
54"x30"x16' Ingersoll Slab Mill.

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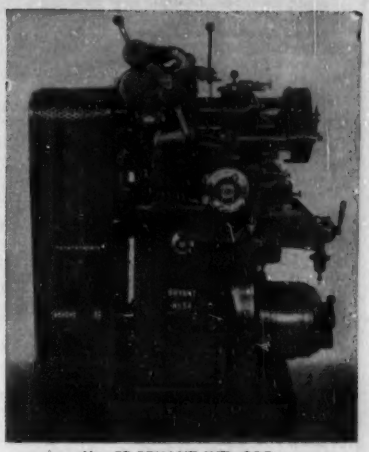

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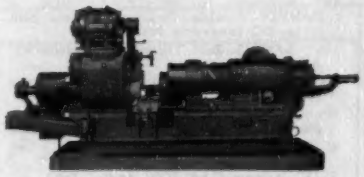

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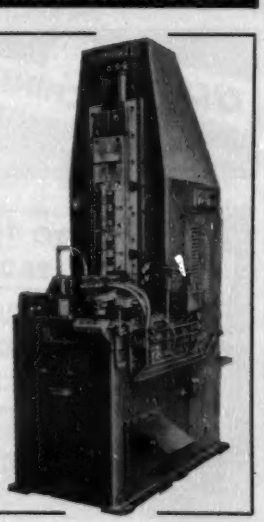

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60"x20' NILES-BEMENT-POND Geared Head Engine Lathe, rapid traverse
No. 1L GISHOLT Saddle Type Universal Turret Lathe, preselector head, bar feed, chuck, new 1943
No. 1A WARNER & SWASEY Universal Turret Lathe, Timken spindle, electric chuck
No. 2A WARNER & SWASEY Universal Turret Lathe, preselector head, bar feed, chuck, new 1943
No. 3A WARNER & SWASEY Turret Lathe, Timken spindle, electric chuck, tooling
No. 3 WARNER & SWASEY Universal Turret Lathe, 800.000 series
No. 4 GISHOLT Turret Lathe, Timken spindle, hardened ways
No. 2 VAN NORMAN Plain Horizontal Mill, New 1943
No. 3-24 CINCINNATI Plain Hydromatic Mill, AC-MD
No. 4 CINCINNATI High Speed Dial Type Plain Horizontal Mill, new 1942
No. 4 CINCINNATI High Power Dial Type Vertical Mill, 25 HP motor, new 1951
No. 5 CINCINNATI High Power Vertical Mill, new 1951
48"x48"x10' NILES Double Housing Planer, box table, DC reversing motor drive.
48"x48"x12' Cincinnati Double Housing Planer, power rapid traverse, DC reversing motor drive, box table, forced feed lubrication.
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No. 6A MITTS & MERRILL Keyseater, capacity 0 to 4" width, 36" stroke, tooling
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5'-13" column CARLTON Radial Drill, AC motor & gearbox on base
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IL GISHOLT Universal Turret Lathe, 1946.
No. 8A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes.
No. 2 CINCINNATI HS Dial Type Plain Millers.
No. 0-8 CINCINNATI Plain Milling Machines.
No. 2M CINCINNATI Vertical Miller, 1941.
FITCHBURG Plain Horizontal Mfg. Type Milling Machine, 24"x72" table.
No. 1-18 CINCINNATI Plain Mfg. Miller.
No. 3B BROWN & SHARPE Dual Control Plain Miller
No. 5 CINCINNATI High Power Plain Miller with motorized overarm
6"x60" P&W Model C Thread Miller
E-5 & 2AL NATCO Multiple Spindle Drilling Machine
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No. 12 FELLOWS Gear Shaver, 1943.
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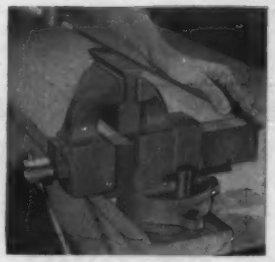

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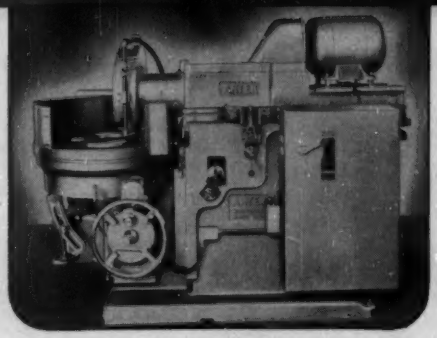

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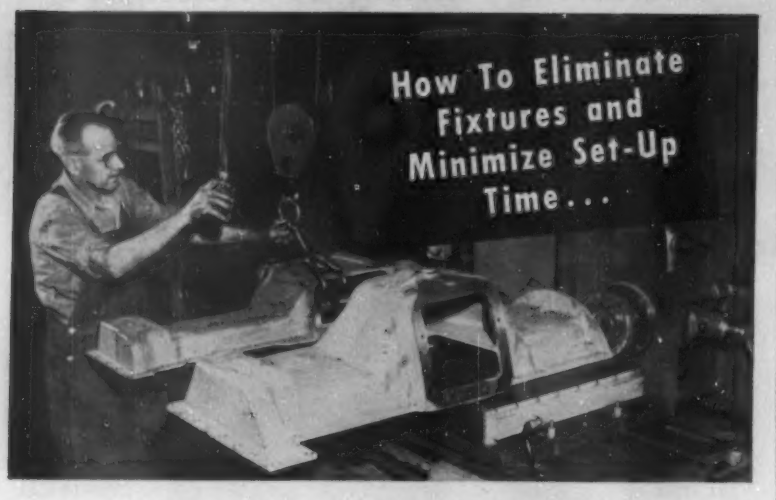

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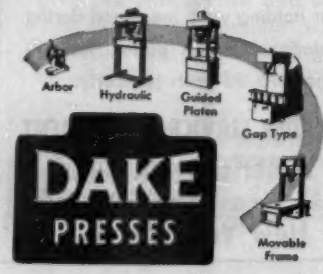

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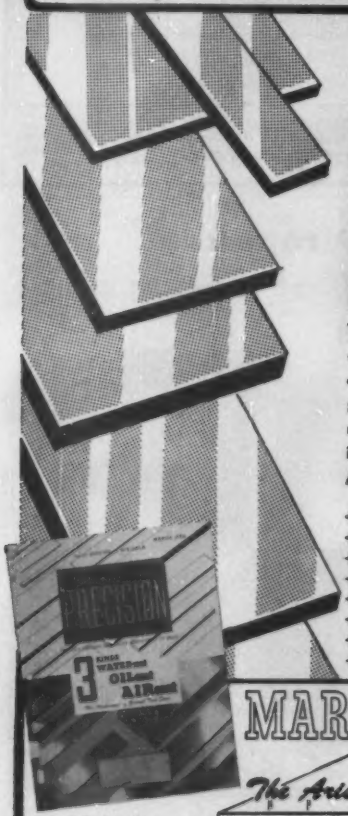

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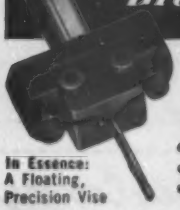

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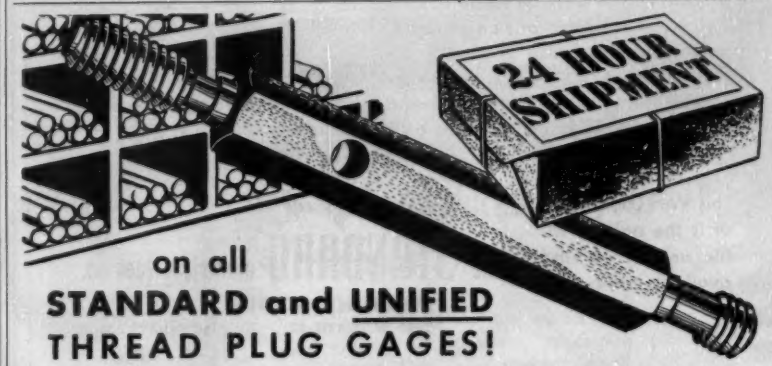

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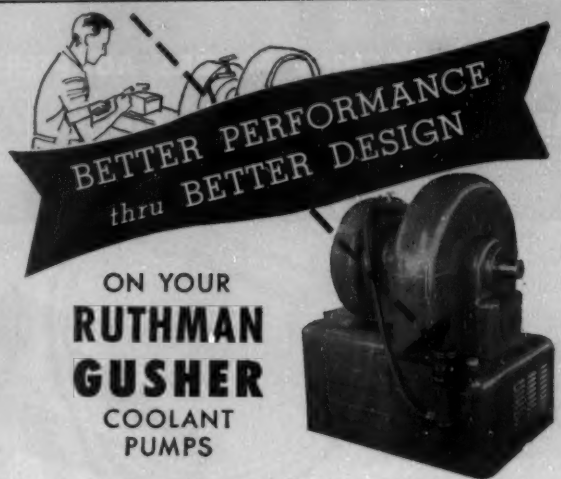

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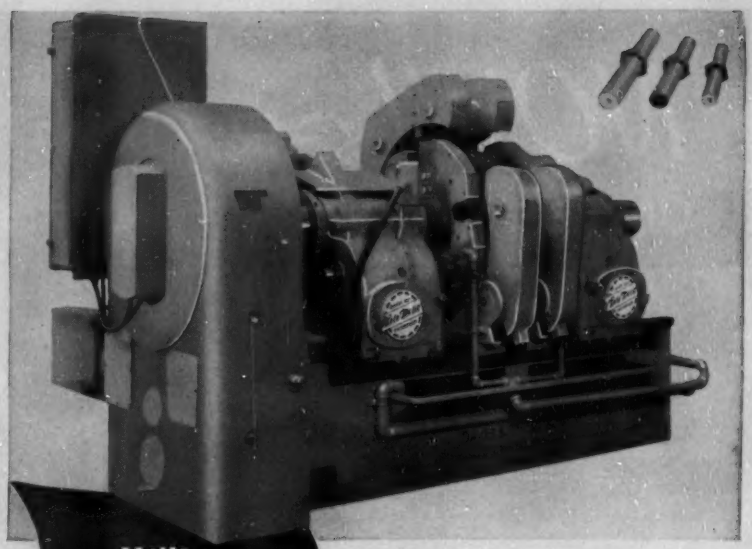

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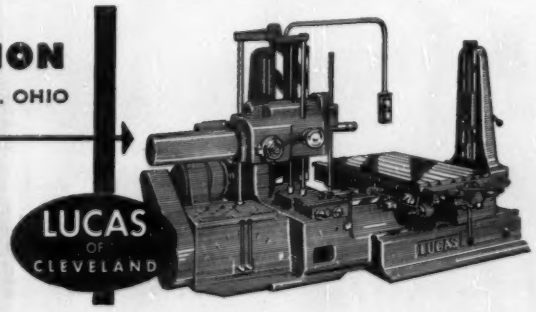

High speed spindle gets greater accuracy with TIMKEN® bearings in new semi-flexible mounting

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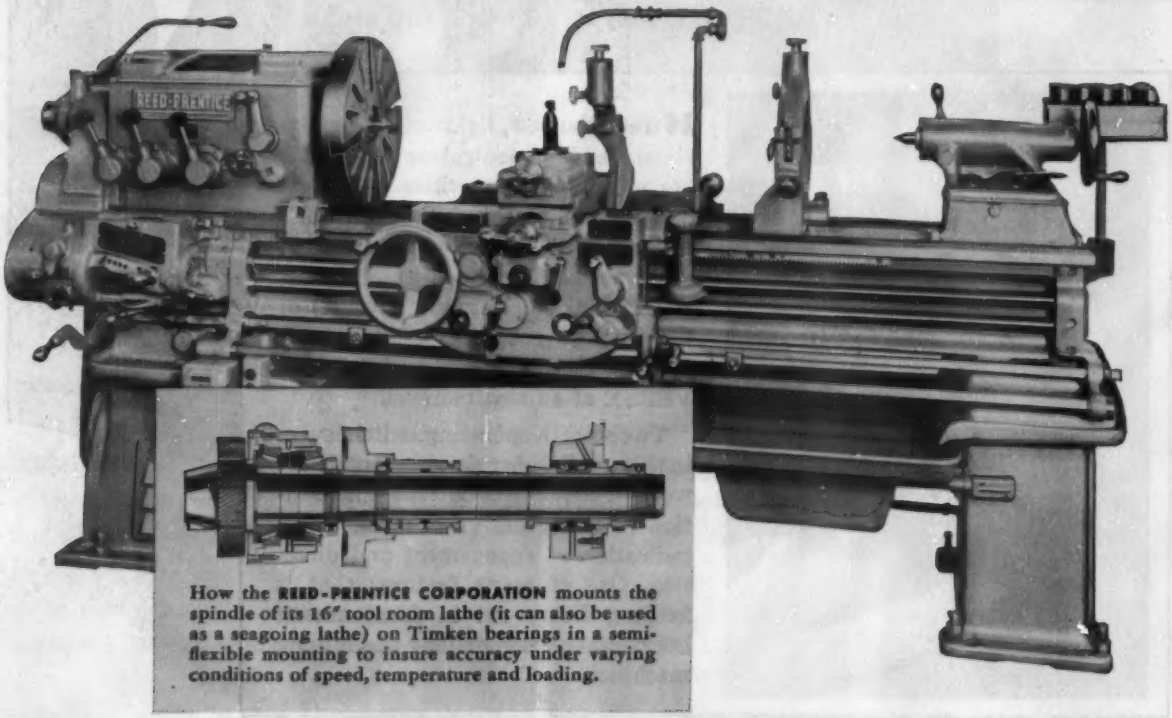

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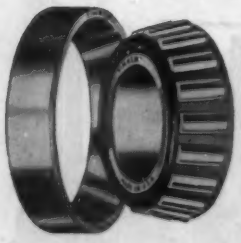

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